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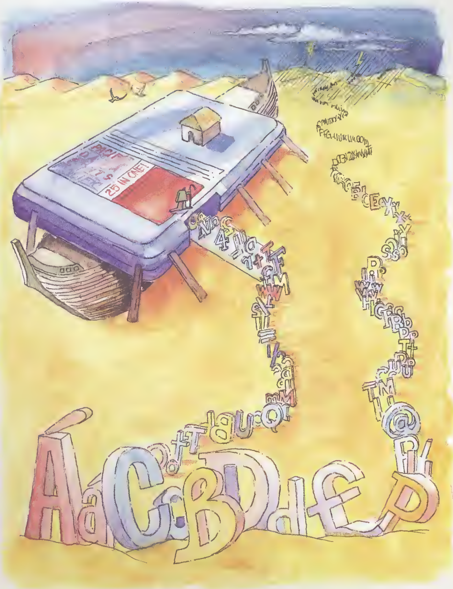

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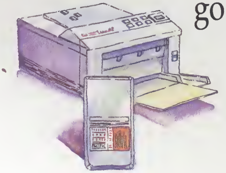

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CIRCLE 101 ON READER SERVICE CARD

LOTUS

SPECIAL REPORT

63 INTRODUCTION

64 CHOOSE THE RIGHT DATABASE PROGRAM
Learn which progam to use.
BY LOTUS STAFF

67 THREE WAYS TO ANALYZE DATABASES
No need to master elaborate database operations to get the information you want.
BY PAULA DEMPSEY

70 QUERY EXTERNAL TABLES WITH 1-2-3 RELEASE 3
Improve your access to database information.
BY JUSTIN FIELDING

73 A FAST WAY TO BUILD DATA-ENTRY FORMS
{FORM}, a Release 3 command
BY KELLY CONATSER

77 CUSTOM REPORTS FROM SYMPHONY
Go beyond the simple row-and-column format.
BY PAUL WILKERSON

81 DATABASE ADD-INS FOR 1-2-3
The help you need may be in the database aftermarket.
BY RICH FRIEDMAN

FEATURES

38 TO CONTROL PRODUCTION, POINT AND SHOOT
A vertical-bar menu and selection tables make *1-2-3* work for machine operators.
BY NICHOLAS J. LOSOLE

48 RANGE NAMES ARE EASIER TO REMEMBER
Why call a worksheet range A10..B12 when you can call it *costs*?
BY DANIEL GASTEIGER

56 THE NORMAL CURVE—A SIMPLER WAY
Use a time-honored statistical method without looking through tables.
BY PHILIP PFAFF

2 STAFF LETTER

4 LETTERS

8 IDEAS & TRENDS
Escape Network RAM Cram
Also: laser printers, new font standard, games, interview with Chris Smith, Shorts

20 @LOTUS

24 START HERE
More on Database Management
BY DANIEL GASTEIGER

MACROS

28 1-2-3 MACROS
Set Up Your Databases Automatically
BY NICK DELONAS

32 FOR DEVELOPERS
When to Avoid the {BRANCH} Command
BY NICK DELONAS

RESOURCES

84 Q&A

88 GOOD IDEAS

REVIEWS

92 Ideas by the Screenful: *IdeaFisher* and *Idea Generator Plus*
BY BRYAN MATTIMORE

96 Faster Saves, Faster Sorts: *Vcache, Super PC-Kwik Disk Accelerator,* and *Flash*
BY PETER G. AITKEN

99 Cutting the Cost of Business Forms: *PerForm Designer & Filler* 2.0 and *JetForm Design* 2.0
BY JON PEPPER

102 ADVERTISER INDEX

102 EDITORIAL EVALUATION

102 READER SERVICE CARD

103 NEW PRODUCTS
Applause II and more

110 ESSAY
The Changing User-MIS Relationship
BY FRANK ROSE

COVER: DOUGLAS FRASER

48 *Simplify with range names.*

LOTUS

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STAFF LETTER

A FEW THINGS NOT TO MISS

There are certain things in this issue that you shouldn't miss, and I want to point them out. But first, I want to apologize to some of you who looked in vain for our models on CompuServe during the month of October.

We told you the 1989 models would be downloadable by then, and they weren't. Not our fault. The folks who were reworking the Lotus forums just missed their target date.

The models are there now. We told you in November (page 87) how to download them. In this issue, we tell you, on page 22, how you can leave messages for us in the Lotus Spreadsheet Products Forum.

When you're browsing in that part of the issue, be sure to look at page 20—especially if you're connected to a network. You'll learn about a new product, called *Lotus Notes*, that is being released this month. You may think of it as a kind of *Lotus Agenda* for work groups. There's been a lot of talk about this product in the computer press this year, much of it speculation. Now, finally, you can get solid information about what it can do for you.

If you're involved with production control in manufacturing, you ought to look at the lead feature on page 38. It tells how to build a macro-driven *1-2-3* template that a machine operator on the factory floor can use to record production data—with next to no training on a computer.

This is the first of several articles about production control. Later on we'll show you how to use *1-2-3* to analyze the data it captures.

Finally, I'm sure that you will be rewarded if you dip into this month's special report, "Managing Databases," which Senior Editor Dick Ridington put together. We keep coming back to this subject because you tell us that *1-2-3*'s database techniques are the most difficult to master.

You'll find, beginning on page 63, a collection of articles that offer practical help, starting with the answer to the basic question: Is this the type of database that *1-2-3* or *Symphony* can handle?

If you're a database pro, you'll probably want to focus on the tutorials about two key features of *1-2-3* Release 3. One is the Data External command, which lets you treat any external table, anywhere on your network, as just another Input range. The other is {FORM}, the new macro command that offers a much faster way to set up a simple, foolproof data-entry system.

And while we're talking databases, be sure to look at Nick Delonas's 1-2-3 Macros column on page 28. He has built a macro that you can use to take the drudgery out of setting up a *1-2-3* database. In the January issue, he'll do the same for *Symphony*.

I'll let you discover for yourself the other good stuff in this issue. Meanwhile, best wishes from all of us for a happy year's end and a good start in 1990—when we'll see you again.

John B. Campbell
Editorial Director

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CIRCLE 102 ON READER SERVICE CARD

LETTERS

AN @IF FORMULA SAVES THE DAY

I'd like to thank Paula Dempsey and *LOTUS* for the double @IF formula that appears on page 80 in the September issue's Special Report on formulas.

Having set up a generic real estate closing statement based on the model by Charles E. McClellan [March], I wanted the calculation section to show what proportion of the real estate tax was owed by one party to the other. I had also made the seller's statement, the buyer's statement, and the calculation section interactive so that the basic information could be entered only once and appear in the appropriate places.

Out of frustration, I had prepared one line if the seller underpaid and one line if the seller overpaid the pro rata share. The double @IF formula caught my attention and did the trick.

Caspar F Cowan
Perkins, Thompson, Hinckley & Keddy
Portland, Maine

SPARC CHIP NOT PROPRIETARY

Steve Stecklow's article on the Intel i486 chip announcement [Ideas & Trends, August] incorrectly refers to the Sun Microsystems' Sparc chip as "proprietary." While this company was instrumental in bringing the Sparc (Scalable Processor Architecture) chip to the marketplace, it has since relinquished control of this technology to a group of five semiconductor manufacturers that includes Texas Instruments, Fujitsu, and Cypress Semiconductor Corp., each of which is developing different chip implementations based on this technology.

Robert A McCauley
San Antonio, Tex

Editor's note: *Thanks for pointing out that Sun is in fact encouraging other companies to use the Sparc technology it developed.*

FAX PROS AND CONS

"Sending Faxes from Your PC" [Data Transfer, August] was a bit of a disappointment in that the author neglected to point out this disadvantage: The recipient must rekey the contents of a received fax before he can manipulate the data it contains, whereas transmitting the file itself permits the recipient to use the work of the sender immediately.

I exchange complete *1-2-3* worksheet files via CompuServe by using inexpensive telecommunications software. I use *TapCIS*, a shareware product specifically tailored for use on CompuServe, as well as *Ato*, a similar freeware product. However, almost any telecommunications software that can send binary files will work satisfactorily.

In addition, the author mentioned only one nonfax-board service in the sidebar, whereas CompuServe (home of the Lotus forums!) and Western Union Corp., to name but two of many such services, also provide fax service to fax machines worldwide, at rates similar to those charged by MCI and without the necessity of purchasing a fax board or machine.

Evans M Harrell
Marietta, Ga

Editor's note: *Thanks for your suggestions about other services.*

You are, of course, right about the drawback of fax machines. Faxes don't replace direct file transfer. But they are right for those times when your correspondent needs nothing more than a printed report.

Accessibility is another reason faxes are here to stay. Often your correspondent doesn't know how to perform file transfer via modem, doesn't have a modem, doesn't have the same file-transfer software as you, or doesn't subscribe to CompuServe. However, he can almost always receive a fax, if not directly, then at the nearest copy center or drugstore that makes its machine available for a fee.

SYMPHONY COVERAGE CONTINUES

What is happening to the *Symphony* Macros articles? Three or four recent issues did not include this column, and we really miss it. In fact, we feel there aren't enough articles devoted to *Symphony*, which is the software we use throughout our company.

Carol A. Consolo
Allendale Insurance
Seven Hills, Ohio

Editor's note: *We did recently reduce, but certainly will not discontinue, our coverage of* Symphony *macros. The reduction is part of an effort to apportion more equitably our total coverage of* 1-2-3 *and* Symphony. *Only one-fifth of our subscribers use* Symphony.

IF YOU WANT TO KNOW ABOUT LOTUS AGENDA

I'm ecstatic about *Lotus Agenda*! It has become the main program I use in my work as a film producer. In terms of hourly use, it rates above even word processing! In fact, I mention the program to virtually everyone I know who uses a computer.

LOTUS Magazine, to my knowledge, hasn't even mentioned *Agenda*. What gives? Perhaps the publication is merely dedicated to the spreadsheet arena. But its very name implies that Lotus products will be reviewed.

Bob Anderson
Tujunga, Calif

Editor's note: *We ran an article on* Agenda *in November 1988 (page 60), and we discussed it along with two other "personal information managers" this past June (page 85). This magazine took its name when the only Lotus products were* 1-2-3 *and* Symphony, *and we have stuck pretty close to our original charter: to support the users of Lotus spreadsheet products. We do cover other programs that we feel could be important to spreadsheet users—but not in much depth unless a healthy percentage of subscribers indicate interest.*

CLEAR STEPS TO REMOVE COPY PROTECTION

I want to congratulate Steve Arsenault for his article "Goodbye Copy Protection" [July]. His step-by-step guidance enabled me to succeed finally in removing the copy protection from my copy of *1-2-3* Release 2.01. I had been reluctant to tackle that task previously because I had had difficulty understanding my 1-2-3 Value Pack instructions.

Lowell Mix
San Antonio, Tex

@ERR

New Products (October), page 103: The phone number for ILAR Systems, maker of *Bottomline V*, is 800-777-4920, in Calif. 714-759-8987.

Letters to the editor should be sent to Letters Editor, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123. Letters may be edited for length and clarity.*

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CIRCLE 103 ON READER SERVICE CARD

Before you make any big decisions over which laser printer to buy, we'd like to point out a few little things about the new Canon LBP-4.

The first of which is size. Unlike most "desktop" printers that need a space the size of a football field to fit in your office, the LBP-4 is compact. So it actually fits on top of your desk.

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Very little to get

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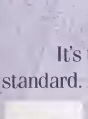

A printer driver kit is provided free with each new LBP-4 containing all printer definition files currently available for this printer on diskette, plus complete installation instructions.

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CIRCLE 104 ON READER SERVICE CARD

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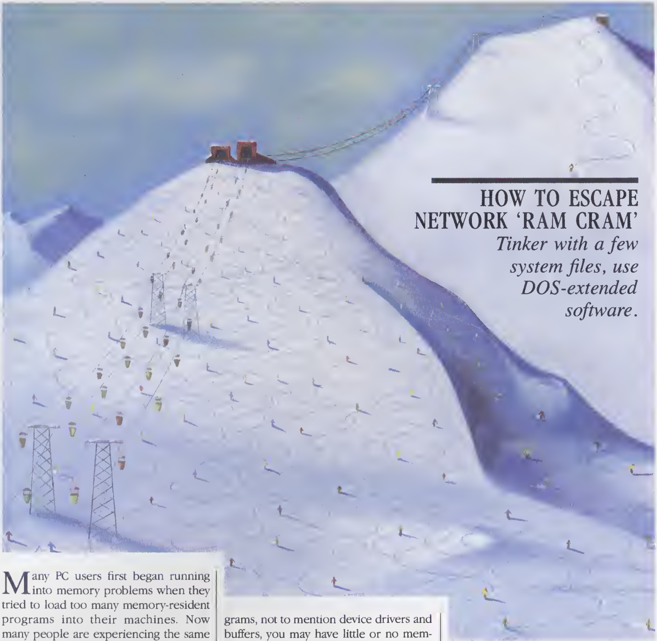


HOW TO ESCAPE NETWORK 'RAM CRAM'

Tinker with a few system files, use DOS-extended software.

Many PC users first began running into memory problems when they tried to load too many memory-resident programs into their machines. Now many people are experiencing the same "RAM cram" when they try to run their favorite programs on a network.

Not surprisingly, both application and network-software vendors are looking for ways to kick their program code out of RAM and into the "high" memory above 1,024K. In the meantime, you can try a few tricks yourself to alleviate the problem.

Networks exacerbate RAM cram because each connected PC must run software that establishes and maintains network communications. This software, called a network shell, can occupy 100K or more of your computer's RAM. By the time you load DOS, the network software, and your memory-resident programs, not to mention device drivers and buffers, you may have little or no memory left to run applications.

"It definitely is a problem," acknowledges Richard King, vice president of software development for the network products division of Novell (Provo, Utah), "especially with large programs like CAD/CAM applications, databases, and spreadsheets."

How big a problem?

The scope of the problem depends on which network you use, your cabling scheme, and how the network is configured. Here's how some popular networks stack up in the matter of memory.

Novell NetWare is one of the least demanding networks, taking up just 56K on each PC: 35K for the NetWare shell and 21K for the NetBIOS program, which some applications require.

At the high end of the memory-consumption spectrum is the AppleTalk network software from Tops (Alameda, Calif.), which is widely used to link Macintoshes to IBM PCs and to Unix systems. The Tops network software uses up to 190K on each PC in the network.

In between are the Banyan Vines network from Banyan Systems (Westborough, Mass.), which takes up just over 100K, and the 3+Open LAN Manager network from 3Com Corp. (Santa Clara, Calif.). The 3Com network requires 90K

ROBERT WISNEWSKI

to 115K, depending on your microprocessor, but on a '386-based computer, you can load all but 60K into high memory.

PC memory, says Mary Kirson, Banyan's director of product marketing, is what you trade off for the compatibility of applications on the network.

Fine-tune your system

You can avoid the trade-off altogether by switching to another operating system. OS/2, Unix, and the Macintosh, for example, can access memory beyond the 640K limit of DOS. But if you're sticking with DOS, you can reclaim some conventional memory by fine-tuning your system files a bit. First find out which version of DOS you have installed. You can save 40K just by using DOS 3.3 instead of DOS 4.0, which takes 75K.

The next step is to check your DOS CONFIG.SYS file for memory-robbing statements. For example, you may see a statement like LASTDRIVE = Z, which instructs DOS to reserve enough memory to mount 26 storage devices, drives A through Z. Every drive you reserve costs 80 bytes of memory. And chances are you don't need that many drives. Buffers take up even more memory than drives do. The BUFFERS = statement tells DOS how many disk buffers to maintain. Up to some point of diminishing return, usually between 10 and 20 buffers, the more buffers you specify, the better your system's performance. But every two buffers exacts a 1K memory toll.

Also make sure your AUTOEXEC.BAT file isn't loading any terminate-and-stay-resident programs that you rarely use. Instead of having your AUTOEXEC file load your memory-resident programs automatically, load them manually only when you need them.

Use a DOS extender

These measures will help, but they won't solve your problem entirely. A better approach is to shift your network software and applications out of conventional memory and into extended or expanded memory—memory above 1,024K. (For a discussion of the different types of memory, see "A '286 or a '386: Memory Makes the Difference" in the October issue, page 6.) The trick is to feed your computer a steady diet of programs that incorporate so-called DOS extenders, which let programs use up to 16 megabytes of memory.

The list of DOS-extended applications is large and growing fast. In addition to *1-2-3* Release 3, there are *AutoCAD* from Autodesk (Sausalito, Calif.), *Paradox 386* from Borland International (Scotts Valley, Calif.), and *Interleaf Publisher* from IBM, to name just a few.

DOS-extended programs are less of a drain on your PC's conventional memory because they load some of their code into high memory. When you install *1-2-3* Release 3, for example, it senses the amount and type of memory in your machine and configures itself to take up as little conventional memory as possible. According to Robert Perry, Lotus's manager of *1-2-3* product programs, Release 3 takes up only about 30K of conventional memory if you run it on a PC AT or '386-based machine with more than a megabyte of memory.

Different types of memory

1-2-3 Release 3 uses a DOS extender developed by Rational Systems (Natick, Mass.) and can use either extended or expanded memory on both '286 and '386 computers. Some programs, however, will run in high memory only on '386 machines. For example, both *Paradox 386* and *Interleaf Publisher* use a DOS extender from Phar Lap Software (Cambridge, Mass.), which can't access extended memory on most '286 machines.

Network vendors are also revising their network software to run in expanded or extended memory. Tops, for example, plans to incorporate Rational Technologies' DOS extender in the next version of its network software, which should be out by the time you read this. 3Com's 3 + Open LAN Manager network will load some, but not all, of its code into high memory on '386 systems. Novell is working on an expanded-memory shell that will work with any scheme for expanded-memory management, which means you can use it on a '286 with an expanded-memory board.

In the meantime, Novell NetWare users can take advantage of *LANSpace*, a utility program from LAN Systems (New York). *LANSpace* places the NetWare shell into extended memory and also unloads the NetBIOS program automatically for applications that don't need it.

The program costs $495 per server and works with Novell NetWare Version 2.1 or higher on any PC AT–compatible computer with 1 megabyte of memory or more. Each network PC must have DOS 3.0 or higher and 64K of free extended memory.

Those who use '386 machines can take advantage of *QEMM-386*, an expanded-memory management program from Quarterdeck Office Systems (Santa Monica, Calif.). A *QEMM-386* file called LOADHI can relocate 120K or more of the network software or other memory-resident programs into available memory between 640K and 1,024K, says Gary Saxer, Quarterdeck's director of technical services. That's enough to move all of NetWare, 3 + Open LAN Manager, or Banyan Vines software.

QEMM-386 runs only on '386 machines, but Quarterdeck is working on a program for 80286 and 8088 machines, called *QRAM*, that contains LOADHI. The program should be available this month, according to the company.

If you have a '286 system, you might consider buying an upgrade card that converts your '286 into a '386SX so that you can use the '386 solutions. Alternatively, you can use a $399 circuit card called the All Chargecard, from All Computers (Toronto). The card lets a '286 computer use extended memory for standard DOS applications and also lets you run '386-only programs. Installation is a matter of relocating your 80286 chip to a socket on the Chargecard.

—Laurence J. Magid

A LASER PRINTER ON EVERY DESKTOP?

New models cost little more than a high-end dot-matrix.

A laser printer has long been the printer of choice for those who could afford one. For the rest of us, $1,000 is the magic number that analysts and buyers alike have considered would move laser printing into the mainstream. Now we'll see if they're right. Hewlett-Packard has unveiled its new 4-page-per-minute (ppm) LaserJet IIP at a list price of $1,495, but the street price is already about $1,000.

And HP isn't the only company making news with less-expensive models. Toshiba America Information Systems (Irvine, Calif.) and Epson America (Torrance, Calif.) have introduced 6-ppm models based on a new laser printer engine from Tokyo Electric Co. (Tokyo) at $1,899—about $600 less than Hewlett-

Packard's 8-ppm LaserJet Series II.

These low-cost laser printers are likely to initiate a profound change in the structure of the printer market. According to David Hudson, an analyst with BIS CAP International (Norwell, Mass.), these new printers should increase the market for the under-10-ppm laser printers from shipments of 796,000 units in 1988 to almost 2 million by 1993, with most of the growth in the 4-ppm to 6-ppm category. At the same time, he says, sales of dot-matrix printers should peak at about 5.3 million units in 1990 and then turn downward. "We project sales of 4.8 million dot-matrix units in 1993," he says, "but even that might be optimistic."

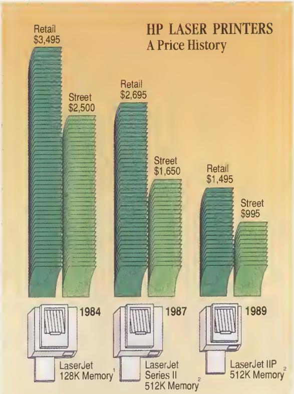
A laser all to yourself

Until now, if you wanted high-quality printing but couldn't afford a laser printer, you bought a high-performance dot-matrix printer or an ink-jet printer and sacrificed some print speed, output flexibility, and quiet operation. Many businesses could justify buying a laser printer only by having several people share it. But with a laser printer costing only a few hundred dollars more than a high-performance dot-matrix printer, "the corporate world and small-business users will be able to justify buying a laser for one user," says Angèle Boyd, manager of the printer market planning service at International Data Corp. (IDC), a market research firm in Framingham, Mass.

Moreover, at less than 25 pounds and at about the size of a compact microwave oven, the new HP IIP is significantly lighter and smaller than HP's 8-ppm LaserJet Series II, which adds to its appeal as a single-user desktop product.

But the dot-matrix market won't disappear overnight. Boyd thinks the extreme price sensitivity at the low end of the printer market will sustain dot-matrix sales for some time. "After all," she says, "9-pin dot-matrix printers still constitute more than half of all printer shipments."

"The further down the market spectrum you go, the more price sensitivity there is," agrees Hudson. "A $200 price difference can mean a different competitive bracket."



[1] Expandable to 2 megabytes for about $1,500

[2] Expandable to 4 5 megabytes, expanding to 2.5 megabytes costs about $1,000 for the IIP, $1,200 for the Series II

The price-sensitivity issue is particularly pertinent in light of the fact that the price of the LaserJet IIP is so close to that of HP's popular ink-jet printers, the DeskJet and DeskJet Plus. David Ritchie, HP's product manager for the LaserJet IIP, thinks it's possible that the IIP will pirate some DeskJet and LaserJet Series II sales. "But our users told us they wanted a laser printer at a price between the DeskJet and the Series II," he says, "and we gave it to them."

Slightly slower operation

Not surprisingly, the lower prices come at the cost of some operational compromises. In the case of the LaserJet IIP, the main trade-off is speed—down to 4 ppm from the LaserJet Series II's 8 ppm. Otherwise, you get the same 300-dot-per-inch (dpi) print quality and 512K of memory, which you can expand to 4.5 megabytes.

However, IDC's Boyd thinks that the slower speed won't matter much. "In the mind of the user," she says, "a few ppm makes little difference." And because the new HP printer was designed for improved input/output, you might not notice the difference at all for small print jobs. In fact, Michael Weiss, president of MWA Consulting (Palo Alto, Calif.), says he found that the IIP prints documents of fewer than three pages faster than the Series II does, and that the two printers print at the same speed for many other print jobs. Toshiba also claims that its new printer gets the first page out faster than its previous models.

You'll also sacrifice a bit in terms of the monthly print volume, says BIS CAP's Hudson. The LaserJet IIP, for example, is rated for a maximum monthly print volume of 6,000 pages—half that for HP's LaserJet Series II. "But most page printers are underused anyway," says Hudson, "even those in the 8-ppm bracket."

Where does all this leave the new 6-ppm offerings? Rono Mathieson, Toshiba's senior product manager for laser printers, thinks the new Toshiba PageLaser6 will compete more with the LaserJet Series II than with the lower-cost IIP. "From the standpoint of design, machine life, paper capacity, and other factors, we are much closer to the Series II," he says. "People don't want to compromise in paper-handling flexibility, font flexibility, or in other areas."

More competition for the Series II

IBM also means to give HP's LaserJet Series II a run for its money. IBM's new laser printer is smaller, faster, and—at $2,595—$100 less than the Series II. At 14.2 by 14.2 inches, the IBM LaserPrinter takes up about 40% less desk space than the Series II. And at a rated speed of 10 ppm, it prints 25% faster. The LaserPrinter comes with 512K of memory and can emulate several page-description languages, including HP's Printer Command Language. IBM plans to add PostScript to the list in the first half of 1990.

The consensus among analysts is that the HP LaserJet IIP will take the lion's share of the low end, just as HP's LaserJet Series II currently dominates the 8-ppm market. However, analysts expect the demand for low-cost laser printing to provide a comfortable market for offerings like the Toshiba and Epson models.

Indeed, there seems to be little reason

DAVE HANNUM

to wait. Few expect to see the prices drop any further for a while. "Every couple of years a technology breakthrough lowers prices," says Hudson. But aside from unconfirmed industry rumors of yet lower-priced printer engines, "things are as low as they can go for the foreseeable future." *—Jon Pepper*

APPLE, MICROSOFT UNITE ON A FONT STANDARD

Easier to use, scalable type for Macs and PCs

Millions of personal-computer users are concerned—or should be—about the appearance of the words and numbers that populate their documents. Trouble is, there are nearly as many ways to generate and employ fonts on a PC as there are letters in the alphabet. And despite WYSIWYG (what-you-see-is-what-you-get) claims from software developers, what you see on the screen isn't exactly what you get on paper.

Apple Computer and Microsoft Corp. have agreed to try to forge a new standard. In a rare merger of interests between the PC and Macintosh worlds, the two companies signed a cross-licensing agreement that could yield one standard for displaying and printing fonts across both computing environments. The accord enables Microsoft to use Royal, code name for Apple's new technique for outline (or scalable) fonts in the OS/2 Presentation Manager interface. For its part, Microsoft will license to Apple its recently acquired PostScript-compatible printer software for use in future versions of Apple's LaserWriter models. Currently, Apple is licensing PostScript from the developer, Adobe Systems, for its LaserWriter printers.

Apple is expected to deliver its new method for producing fonts in the next release of its system software for the Mac, which is slated for the first half of 1990. Microsoft has said only that it will include the font technology in a "future version" of OS/2's Presentation Manager. Version 2.0 of OS/2 is expected sometime in 1990, but at press time Microsoft hadn't said whether that version will include the Royal technology.

The Apple-Microsoft agreement promises to make using fonts far simpler and more flexible than it is today. In place of a handful of typefaces at fixed sizes, users will be able to draw on a vast library of fonts and scale them to any size they need. The screen image of these fonts will match their printed form exactly, and exchanging typographically rich documents and sharing output devices among PC-compatible and Macintosh computers will be easier. For users, it's these bottom-line benefits that make this agreement so significant.

"This is not an esoteric issue," says Jonathan Seybold, president of Seybold Seminars and publisher of the *Seybold Report on Desktop Publishing*. "This is one of the fundamental building blocks for the next generation of computers."

ROBERT WISNEWSKI

Indeed, as graphical interfaces such as Presentation Manager and *Microsoft Windows* become the norm in the coming years, Seybold believes the importance and use of fonts will increase across the wide spectrum of PC applications. "That's true not just for desktop publishing or word processing, but also for database and spreadsheet applications and everything else as well," he says.

A growing interest in fonts

Although it may be a year or more before users reap any rewards from a standard font technology, many software publishers concur that a rising interest in fonts and document appearance is inevitable. "In the future, spreadsheet users will be much more concerned about fonts and appearance than they are today," predicts Marty Fahey, general manager for Lotus Development Corp.'s *1-2-3/G*, the forthcoming graphical version of *1-2-3* for Presentation Manager. "Many of the things that people like in *Allways* [the 'spreadsheet publisher' utility for *1-2-3* and *Symphony*] will be built right into Presentation Manager products."

Because the font features won't appear until a later version of OS/2 and Presentation Manager, Fahey says the Apple-Microsoft agreement will not affect the delivery or capabilities of the initial version of *1-2-3/G*.

In the meantime, developers and users have other solutions to consider in mapping a fonts strategy. Hewlett-Packard, for one, is introducing a scalable-font technology, called Intellifont, into the PCL language that drives its LaserJet models. HP, which has so far sold more than 1.5 million LaserJets, is the leader in laser printers. The company contends that the popularity of the LaserJet line and the widespread software support it enjoys will help make Intellifont a standard. (For a look at HP's new low-priced laser printer, see page 9.)

"We're committed to Intellifont; it's ready to go," says Bill McGlynn, marketing manager for LaserJets at HP's Boise, Idaho, printer division. "It's very likely that we're going to have another million or so LaserJets sold with the Intellifont technology by the time the Royal technology ships."

Microsoft, in recognition of HP's market standing, announced it will work with HP to develop a special Presentation Manager device driver for the new LaserJets with Intellifont capabilities. At the same time, however, Microsoft claims the Royal system is "better technology" for the long term. "Royal is the strategic direction for OS/2 and Presentation Manager," insists Peter Neupert, senior general manager for OS/2 at Microsoft. "But," he concedes, "there are other technologies out there today that we also have to accommodate somehow."

PostScript is another of those technologies. Adobe's PostScript, which first brought scalable type to desktop computers via Apple's LaserWriters and other printers, is still the predominant format in outline fonts. But Apple's split with Adobe and its licensing of an "enhanced" PostScript-compatible language from Microsoft have cast a shadow over the future of Adobe's PostScript. Soon after the Apple-Microsoft agreement, Adobe pledged to enhance PostScript and publish the secrets of its heretofore proprietary font specifications.

"I think it's bad news for everyone . . . especially the customer," says Kevin Wandryk, typographic business manager at Adobe, of the multiple versions of PostScript.

Despite the confusion, Wandryk says he expects that Adobe's PostScript and its Adobe Type Manager technology for matching screen and printer fonts will become a standard in both the Mac and PC arenas and that Presentation Manager will include a device driver for the Adobe products. He also anticipates a much broader selection of PostScript fonts, now that PostScript's specifications have been made public.

Apple still supports PostScript

Apple, meanwhile, has said that PostScript is still central to its printing plans and that it will continue to support existing PostScript devices. How its Microsoft-licensed version of PostScript might differ from Adobe's remains to be seen, but Apple says that should not keep anyone from choosing a font solution today. "A lot of this doesn't make any difference in the short term," explains Jim Gable, product manager for outline fonts at Apple. "What users currently have [fonts and printers] will still work. But [the agreement] enables us to create better, cheaper printers down the line."

The establishment of the Royal technology as the font standard may not be a foregone conclusion. Royal, however, has the backing of a number of key font suppliers, including Bitstream, Linotype, Letraset, and Agfa Compugraphic, some of whom pitched their own font technologies to Microsoft before it came to terms with Apple. "Sure, if they had chosen our technology, it would have given us an edge in the market," concedes Rob Friedman, president of Bitstream. "But the Apple system is a rich environment. It will make typography easier to use for the vast majority of computer users."

Standard-setter IBM has not publicly endorsed (as of this writing) the Royal technology. An IBM spokesperson says Royal will be among the font systems it supports for OS/2—but it may not be the only one it wants to incorporate. "We do believe Royal is a sound font technology," says Tracy O'Neill, an IBM spokesperson, "but we also need to protect and support the font investments that our customers have already made."

—Christopher O'Malley

LET THE GAMES BEGIN: WHAT'S NEW FOR THE PC

Book and movie spin-offs head this year's list.

Each year at this time we try to bring you what we feel is the cream of the crop of this year's entertainment software releases. You know what we're talking about—the games that someone has to force you to stop playing.

Last year, the big news in games was their jump to the IBM PS/2's VGA graphics standard. This year the post-Nintendo generation has been inundated with computer games based on hit movies, popular books, and famous ball players.

Movie buffs, for example, can direct the action in *Indiana Jones and the Last Crusade* or *Licence to Kill*, sports enthusiasts can play *John Madden Football* or *Lakers vs. Celtics and the NBA Playoffs*, and Tom Clancy fans have *Red Storm Rising*, based on the author's 1986 bestseller. Most of the high-tech advances in this year's games are in the increasingly complicated licensing agreements.

The trend toward big-name games is likely to continue, says Doug Glen, director of marketing for Lucasfilm Games, owned by Lucasfilm Ltd., the producer of the movie *Indiana Jones and the Last Crusade*.

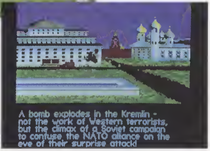
Games are big business

Entertainment software is serious business. This year, players will purchase an estimated $586 million worth of games software, according to Andy Bose, vice president for research and consulting at Link Resources Corp. in New York. So we conducted some very serious research and put in numerous hours of intensive testing. Here's our final cut.

We enjoyed the two movie-based

The plays in Electronic Arts' *John Madden Football* come from the playbooks of the former Raiders coach.

The volleyball tournament in *Kings of the Beach*, from Electronic Arts, takes you to beaches from California to Rio.



A bomb explodes in the Kremlin - not the work of Western terrorists, but the climax of a Soviet campaign to confuse the NATO alliance on the eve of their surprise attack!

MicroProse's *Red Storm Rising* is a detailed underwater simulation based on Tom Clancy's best-selling novel.

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The cure for 1-2-3 Release 3 envy

Look&Link™

1-2-3™ Release 3 delivers impressive 3D features. But many PC users don't have the hardware to run it. And many others are surprised when they discover its trade-offs.*

Let's face it. Lotus has sold us on the *idea* of multi-sheet applications but offers a solution that many 1-2-3 users can't or won't accept. Personics offers a kinder and gentler solution.

LOOK&LINK™ lets you build true multi-sheet applications in 1-2-3 without moving to Release 3. You get dynamic linking and consolidation plus the ability to see two worksheets on screen at the same time. Noted columnist Jim Seymour says, *"LOOK&LINK could be the answer to Lotus users' prayers… It is a lot more important to a lot more users than Allways."*

With LOOK&LINK, any worksheet can pull values out of other worksheets on disk or in expanded memory. (Supported, *but not required!*) There's no limit to the number of linked sheets, and linked values flow in automatically when you load or recalculate. LOOK&LINK even supports automatic chained linking – sheet 1 draws from sheet 2 which draws from sheet 3, etc.

LOOK&LINK's dual sheet display makes setting up links a snap. Just point and shoot. You can also cut and paste between sheets.

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LOOK&LINK 1.1 is an add-in for 1-2-3 Release 2, 2.01 and 2.2. No special hardware or expanded memory is required. Satisfaction guaranteed.

LOOK&LINK adds multi-sheet features to 1-2-3 Rel 2, 2.01 and 2.2

	1-2-3 Release 3	Release 2.2 2.01 & 2.0	Release 2, 2.01 & 2.2 with LOOK&LINK
Link to a single cell	YES	2.2 only	YES
Link to a range	YES	no	YES
Link to a lookup table	YES	no	YES
Linked values in formulas	YES	no	YES
Automatic chained linking	no	no	YES
See two sheets on screen	YES	no	YES
Cut & paste between sheets	YES	no	YES
Point-and-shoot link setup	YES	no	YES
Automatic consolidation	YES	no	YES
Hierarchical consolidation	no	no	YES

*Release 3 is two to three times slower than Release 2.01 in PC Magazine benchmarks. (9/12/89 issue.) It needs lots of memory, lots of hard disk space, and does not support Release 2 add-ins. Expanded memory cards must be re-configured.

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games, *Indiana Jones and the Last Crusade* ($49.95, from Lucasfilm Games, San Rafael, Calif.) and *Licence to Kill* ($29.95, from Broderbund Software, San Rafael, Calif.). The Lucasfilm game features highly detailed graphics and dialogue from the movie. You can run Indy through the same ordeal he survived in the film or invent new hazards. The James Bond spin-off also follows the movie plot. The EGA-level graphics aren't quite as detailed as *Indiana Jones*'s VGA graphics, but we still had a lot of fun.

VGA graphics make for some compelling simulations, and *Red Storm Rising* ($54.95, from MicroProse Software, Hunt Valley, Md.) is one of them. Our favorite underwater entry, however, is *688 Attack Sub* ($49.95, from Electronic Arts, San Mateo, Calif.). The mouse-controlled *Attack Sub* features beautiful 256-color graphics of the various rooms of the submarine, and even photographic-quality black-and-white images of your crew. This game is almost reason enough to get a VGA system if you don't have one. We also like the fact that you can play the game with a friend via modem. May we suggest you choose a friend who is only a local call away.

Another favorite category, perennially, is sports simulations, and this year offered a bonanza of options. *Lakers versus Celtics and the NBA Playoffs* ($49.95, from Electronic Arts) also features the other six teams that actually played in last spring's NBA playoffs, using real stats. All the top players' moves are captured for your control: an "Air" Jordan slam dunk, Kareem Abdul-Jabbar's sky hook, and a drive to the basket for a beautiful finger-roll from Isaiah Thomas. There's even a three-pointer from Larry Bird, despite the fact that he hardly played last season. Unlike some other sports games, this is a full five-on-five game, with sound effects, a shot clock, and challenging play.

Gridiron fans should check out *John*

THE ADD-IN TOOLKIT FOR *1-2-3* RELEASE 3: NOT JUST FOR DEVELOPERS

Chris Smith, the product's marketing manager, tells who it's for and what it does.

One of *1-2-3* Release 3's more interesting aspects is LEAF, a built-in technology for customizing and extending the program. The first fruit of that technology is the Lotus Add-In Toolkit for *1-2-3* Release 3. The Add-In Toolkit lets users access the LEAF technology in order to create complex and sophisticated applications that go far beyond Release 3's macro language.

However, the Toolkit has also raised some questions. Does it replace the macro language? Who is it for? What can it do? Is it easy to use? Is it an essential companion product? In an October interview, Lotus contributor Jon Pepper posed these and other questions to Chris Smith, product marketing manager for the Lotus Add-In Toolkit.

LOTUS: What does Lotus mean when it says that the Add-In Toolkit picks up where the Release 3 macro language leaves off?

Smith: Lotus does not mean that this product replaces macros. Users told us that they wanted programmability, so the Toolkit provides a higher level of customization capability than the macro language does. The Add-In Toolkit also provides more security and control over applications, since applications that are created with the Toolkit can't be altered by users.

LOTUS: Who should use this product—is it just for professional developers, or can advanced *1-2-3* users benefit as well?

Smith: The majority of Release 3 users don't need the Toolkit. But there are three groups of people who will benefit from this product. The first group consists of advanced macro users. The second group consists of corporate applications developers—professional programmers whose job is to create custom programs for corporate clients. The third group consists of independent applications developers—those who plan to shrink-wrap their products.

LOTUS: Could Lotus have reached a larger audience if it had altered the very technical scope and tone of the Toolkit documentation?

Smith: We had to make some assumptions about the Toolkit's audience, and these are reflected in the documentation. The documentation assumes, for example, that you already know how to program in some syntax. It doesn't attempt to teach programming. It is split into three reference manuals: One shows how to use the editor, compiler, and debugger; another covers all the syntax; and a third, the *1-2-3* Release 3 Library, describes all the different procedures. There is also a "quick-start" section that shows a custom @function, a custom macro, and so on. If you are an advanced programmer—in BASIC or Pascal or *dBase*—you can read it and go. Also, there are several books on the way that will fill in any gaps in the documentation.

LOTUS: How will the Toolkit extend the functionality of Release 3?

Smith: The main message is that more people will be able to extend the usefulness of *1-2-3* than could before. We have brought the technology more in tune with the largest developer group—the corporate applications developers who want to solve business problems on micros.

Prior to the Toolkit, for example, you couldn't write a new macro keyword or an advanced macro command. The Toolkit lets you create add-in applications that are subsumed into a single macro command.

LOTUS: What are some specific things you can create with the Toolkit?

Smith: Custom @functions, custom macro commands, data-entry screens—those are three broad categories. You can also build alert boxes and dialogue boxes into an application.

I think a large percentage of Toolkit users will create custom @functions. Anybody who can read a manual and do algebra can write custom @functions for Release 3. It's a lot

Madden Football ($49.95, from Electronic Arts), an 11-on-11-man football game with a play editor, full stats, and a game "report" from Madden, the former Raiders coach who is now a CBS color commentator. The game takes a bit of getting used to, but the action is good. And it's hard not to like a game with such Madden quotes as, "Sometimes I want to take a hand-off, hit the Umph Button, and jam it down your throat."

Fight aficionados might want to investigate *TKO* ($39.95, from Accolade, San Jose, Calif.), which pits you against a friend or the computer in a 16-color pugilistic punch-out. You can adjust the attributes of your fighter, such as the power of his punch. The pirated advertising line promoting this one is, "Reach out and touch someone."

In the "weird sports" category fall *Caveman Ugh-Lympics* and *Kings of the Beach* (both $29.95, from Electronic Arts). The former puts you back in prehistoric times competing for the glory of the Caves of Fame in such events as the Mate Toss, Clubbing, Dino Vaulting, the Dino Race, Firemaking, and the Sabertooth Tiger Race. If you prefer more modern sports, try *Kings of the Beach*, a professional beach volleyball simulation. Designed by the leading beach volleyball players, Sinjin Smith and Randy Stoklos, this is California fun all the way, including a bikini contest to divert you when you get tired of digging those spikes out of the sand.

The world's hottest cars

Auto-racing simulations have long been popular, and several of this year's products have even snappier graphics and more excitement than Accolade's classic *Test Drive*. Don't have $150,000 to spend on a car? No problem. Accolade has released *The Duel: Test Drive II* ($44.95), which lets you zoom around California in two of the world's hottest cars: a Fer-

easier than programming in assembly language, which is a very technical skill and very time consuming.

LOTUS: How much easier is it to create an add-in with the Toolkit than it was before?

Smith: It is definitely easier. For example, one of our beta testers—an independent software vendor—wrote the same add-in for *1-2-3* Release 2, *1-2-3* Release 3, and *Symphony*. He used the assembly tools for the *Symphony* version, a C toolkit for the *1-2-3* Release 2 version, and the Add-In Toolkit for the Release 3 version. The Release 3 version used only a third the number of lines of code in the other versions, which means fewer lines to write, fewer to test, and fewer to document. In short, the Toolkit let him get his job done more easily and more quickly.

LOTUS: Can you use the Toolkit to write add-ins for earlier versions of *1-2-3*?

Smith: No, the Add-In Toolkit works only for Release 3. Lotus has plans to provide similar programmability for other versions of *1-2-3*, but there are no announcements right now.

LOTUS: What are the Toolkit's limits?

Smith: At present you cannot hook into C or assembly-language routines, but you will be able to do that with the next version. You also can't do some advanced things like add new graph types. But once we provide C access, we'll add another dimension. We are working with our design partners on some of these features right now.

LOTUS: How would access to C help programmers?

Smith: Basically, C access lets people hook up what they already have. The trade-off is that if you write with C, you will have to recompile your add-ins for other machines. If you write with the Toolkit, however, Release 3's LEAF technology ensures that compiled add-in modules will run on other platforms without being recompiled. For example, an @function will work between spreadsheets on different platforms.

LOTUS: Does the use of the Toolkit affect the performance of Release 3?

Smith: Well, no one has ever said that the Toolkit is too fast, but it doesn't slow Release 3 down at all. People always ask for things to be faster, and we will try with each revision to make the Toolkit faster.

LOTUS: When will new add-ins for Release 3 appear?

Smith: Several developers already have products for sale, and at least a half dozen more are on the way. In most cases, the pricing will be similar to the pricing of current add-ins. ■

Note: The Add-In Toolkit for 1-2-3 *Release 3 costs $395 and is available through authorized Lotus resellers and through the Lotus Selects catalog (800-635-6887, ask for item LG-4020).*

Accolade's ***The Duel: Test Drive II*** **lets you hop in a Porsche or a Ferrari and hurtle down the California coast at 200 mph.**

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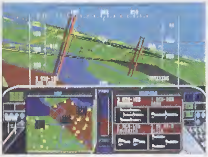
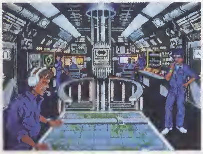


Sneak across the Libyan boarder in ***F-19 Stealth Fighter*****, an exciting flight simulation from MicroProse.**



Listen to whale songs as you hunt and dodge foreign subs in ***688 Attack Sub*****, a tactical naval adventure from Electronic Arts.**

rari F40 and a Porsche 959. You can race head to head with a friend or against the computer, but pay attention—both cars can hit 200 mph.

There is an optional scenery disk, *California Challenge* ($19.95), if you're not going too fast to look, and a *Supercars* disk ($19.95) that lets you add an '89 Corvette ZR1, a Ferrari Testarossa, an '88 Lotus Turbo Esprit, a Ruf Porsche 911, or an '88 Lamborghini Countach 5000S to your garage. We liked the Lamborghini—it's as close as we'll ever get to the real thing.

You might also get behind the wheel in *Vette!* ($49.95, from Spectrum HoloByte, Alameda, Calif.) and *Pole Position II* ($24.95, from Mindscape, Northbrook, Ill.). The former lets you experience the thrill of "redlining" a Corvette, while the latter is an update of the arcade favorite. Both are heavier on speed than they are on skill.

For a true racing simulation that needs both skill and patience, try *Ferrari Formula One* ($39.95, from Electronic Arts). This simulation puts you into the driver's seat of a $350,000 Ferrari F1/86 Formula One racer. You can swap engines, adjust your suspension, and try your luck over some top international racecourses. You can use either a joystick or a mouse.

Action in the skies

If you prefer your action in the skies instead of on the road, look at MicroProse's *F-19 Stealth Fighter* ($69.95). This excellent game features many levels of play to please both novices and experienced simulation fans. With MicroProse's typical attention to detail and fine VGA graphics, *Stealth Fighter* ranks with the best flight-simulation games we know of. As soon as you cross Colonel Moammar Gadhafi's "line of death" in your stealth bomber, you can feel the adrenalin begin to flow.

Those who like interstellar action will be drawn to *Starflight 2* ($49.95, from Electronic Arts), a role-playing fantasy and adventure that pits you against the Spemin, "an arrogant race of slimy blobs." The storyline features 30 alien races, 500 planets, and some intelligent, quick-witted dialogue. And it's always fun to save humanity on your lunch hour.

If saving humanity doesn't excite you, try creating it. *Populous*, a unique adventure and strategy game ($49.95, from Electronic Arts) gives you a shot at omnipotence. With the game's 3-D maps and animation features, you can populate a nation, claim lands, assemble a following, and of course, wipe out opposing populations. Have a bad day? Vent your frustration by creating a volcano or other natural disaster. You can play the computer or a friend via modem. If you need a reality check on your powers, a Manna Level indicator at the top of the screen shows how vital you are.

We also liked *Weird Dreams*, ($39.95, from Medalist International, Hunt Valley, Md.), which puts you into the subconscious mind of a hospital patient about to undergo surgery. The idea is to confront and meet the dream-state challenges that occur to the patient. Highly unusual.

Captain America saves the planet

Comic book fans will enjoy *Dr. Doom's Revenge* ($34.95, from Medalist International), which pits Spiderman and Captain America against evil foes. You follow the game via comic book panels that tell a story and enter certain panels as either Spiderman or Captain America to battle your enemies and save the world from destruction. As if you didn't have enough responsibility already.

For sheer madness, we suggest *Pipe Dream* ($39.95, from Lucasfilm Games), billed as "the fast-flowing game of skill, strategy, and plumbing." Yes, plumbing. You must build a continuous pipeline to contain the rapidly advancing stream of green "flooz." It sounds easy, but the varied pipe sections appear in no particular order and the flooz is relentless. The game is easy to learn, but becoming a master plumber is a long-term endeavor.

Another of our favorites this year was *Demon Stalkers* ($39.95, from Electronic Arts). This is a 99-level-deep fantasy-adventure that requires skill, strategy, and a bit of luck. You can also design your own dungeons to traverse. We won't tell you how much time we spent working on this one. Suffice it to say that *Demon Stalkers* is highly addictive.

From overseas have come three of the most popular Japanese games. The two fantasy-adventures *Wibarm* and *Ancient Land of Ys* and the mystery *Murder Club* ($39.95, $44.95, and $39.95, respectively, from Broderbund) have been adapted for the U.S. market. We especially liked *Wibarm*, the name of the engaging robot fighting to reclaim control of Earth from sinister forces. It was a fresh twist on an old theme. *—Jon Pepper*

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LEARNING TO READ

Depending on the standard of literacy used, the number of adults in the United States who have trouble reading runs somewhere between 27 and 72 million. Moved by this appalling statistic, educators at Temple University's Center for Research in Human Development and Education (Philadelphia) are collaborating with an IBM scientist on an experimental program to help adults improve their reading comprehension. Participants in the program, called One Thing Leads to Another, read a column from the *Philadelphia Daily News* that is reproduced on a computer. The column, which is a news synopsis with background information written in a simple style, is available on-line immediately after publication in that day's paper.

"Being able to discuss relevant issues and also being able to say 'I read in the *Daily News* today...' is very empowering," says Dr. Margaret Wang, director of the center.

Dr. Don Nix, an IBM researcher and the creator of the program, says most low-proficiency readers have difficulty tying sentence ideas together. His reading program uses a PC with a touchscreen, a videodisc player, and a voice synthesizer. A student who is stumped by a word, phrase, or paragraph can select a "hear" option to hear the troublesome text read aloud. In addition to newspaper articles, the computer-assisted reading program includes movies coupled with text explaining the on-screen action. The program is scheduled to be tested soon at a New York City elementary school.

—Rich Friedman

A 'FINGERTIP' PC?

Ever since industry observer Esther Dyson coined the term "luggable" to distinguish barely portable computers from those that were truly portable, everyone and his uncle, it seems, is trying to pinpoint the size of his PC with a different moniker. In addition to laptop, hand-held, and pocket computers, we have the newest entry, the "palmtop." At least, that's how Atari Corp. President Sam Tramiel describes his company's new 1-pound portable called the Portfolio. The name game may get really interesting when the marketing people run low on body parts. Perhaps someone will come up with a "fingertip" PC. *—R. F.*

THERE'S A SCANNER IN YOUR FUTURE

In the next few years, desktop scanners will begin to compete for desk space with personal computers, printers, software manuals, and disk bins. Analysts at BIS CAP International, a market research firm in Norwell, Mass., predict a 36% annual increase in scanner sales over the next four years, from 186,000 units in 1988 to 876,000 in 1993.

Scanners, they say, are riding the crest of the desktop-publishing wave. As people get accustomed to so-called compound documents—documents that contain both text and graphics—scanners will be essential for getting images into your computer.

As more people buy scanners, prices will drop. According to Ajit Kapoor, BIS CAP's director of electronic imaging services, this year's $2,000 desktop scanner will cost $1,000 in 1993. Even as prices drop, scanners are getting more accurate and more versatile. Today you can buy a portable scanner, a scanner that can read colors, or a scanner large enough to handle huge engineering drawings. Big-name companies, such as IBM, Hewlett-Packard, Xerox, Imaging Systems, and Apple, are all selling scanners.

Some industry observers, however, see problems ahead. The scanner market is still too small to have a standardized software interface. Down the road, this may cause compatibility problems. And while many desktop computers now have the speed and memory capacity to store and manipulate images, images are still major memory hogs. BIS CAP's Kapoor says that a single 8½-by-11-inch image scanned at 300 dots per inch with 64 gray levels requires an astounding 6 megabytes. *—R.F.*

ROBERT WISNEWSKI

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Real-World Centrex.

In the tidy world of diagrams, nobody ever moves to a new office. Or changes jobs. But in the real world, moves and changes create telephone chaos. Where can you find a phone system that puts you back in control? At your local phone company. With advanced Digital Centrex Service provided from the Central Office, you get to control, assign and service your own phone lines. Make your own moves and changes. Right from your own premises. Employees get to keep the same phone number no matter where or how often they move. And you get to keep your sanity. All thanks to the state-of-the-art 5ESS® Switch from AT&T Network Systems. Need a change? Make a move. Call your local phone company.

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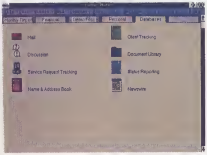
LOTUS NOTES HELPS GROUPS SHARE INFORMATION MORE INTELLIGENTLY

This month Lotus Development Corp. expects to ship *Lotus Notes*, a unique groupware program that runs under the graphical user environments of *Microsoft Windows* and OS/2's Presentation Manager. *Notes* lets work groups gather, organize, and share textual, graphical, and worksheet data over local and wide area PC networks.

The program is a highly flexible application that allows nonprogrammers to create customized "forms" and "views" of database information. In some of its terminology and functionality, *Notes* reminds us of *Lotus Agenda*. *Agenda*, however, is a personal tool, whereas *Notes* is intended to serve as a communications medium for group work.

Here's how *Notes* works: Database information is divided into forms and views. The basic data structure, the form, is a set of user-assigned fields. A form can be a blank memo screen or a highly structured order-entry sheet. Once data is entered, *Notes* can then select, sort, and categorize the documents in the database into any number of views, according to criteria you specify.



From the *Notes* Workspace screen, you can use either a mouse or the keyboard to navigate among the desktop folders.

For example, some 200 Lotus employees are using *Notes* to track discussions of potential product or corporate acquisitions. When a company approaches a Lotus executive with a proposal, the details are entered into a *Notes* form that can be accessed by authorized employees. Other executives can then review the proposal and add their comments to the central form. This allows a new member of the decision-making team to quickly get up to speed on proposed acquisitions.

At Price Waterhouse, a New York-based accounting firm with 200 offices worldwide, Technical Manager Sheldon Laube leads a group that has heen testing a beta version of *Notes*. Says Laube: "Our goal is to tie the whole company together with *Notes*."

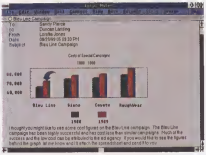
To help you manage and customize your *Notes* databases, the program comes with 95 built-in @functions. You can use these @functions to create formulas that verify and calculate field values and that select, sort, and summarize views.

You can create special filters that will download only specific information from on-line databases. You can also link documents within or across databases with hypertext-like "hot links." A search-and-replace feature makes it easy to find and edit information.

There are several ways to enter information into a *Notes* database. You can type it in with the *Notes* word processor, scan text or images, and import text, worksheet, graphics, or other compatible files. You can proof your documents with *Notes*' spelling checker The program also provides extensive security features, including user IDs and passwords, data encryption, and various levels of database-access control.

To help you get started, *Notes* comes with several example files and six predefined application templates:

- A Discussion template allows a group to exchange ideas, opinions, and information. A person initiates a discussion simply by entering a topic. Someone else in the work group may raise a question or make a point, and others respond. The main view of a discussion database is a chronological list of topics, but you can also view discussions by topic category.



To Sandy Pierce
cc Duncan Lansing
From Loretta Jones
Date 08/25/89 05 08 30 PM
Subject Bleu Line Campaign

I thought you might like to see some cost figures on the Bleu Line campaign. The Bleu Line campaign has been highly successful and has cost less than similar campaigns. Much of the success and the low cost can be attributed to the ad agency. If you would like to see the figures behind the graph let me know and I'll attach the spreadsheet and send it to you

The *Notes* form is where you compose your documents. A document can contain graphics, text, and scanned images.

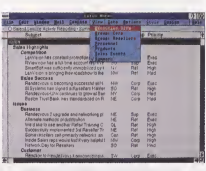
- A Document Library template works like a shared filing cabinet for a work group's collective knowledge and resources. Group members can comment on or add information to any library document they have access to. The main view is an index by category, title, and author. An audit trail shows how many times a document has been edited and who the last editor was.
- A Status Report template tracks projects and the responsibilities of each group member. This application keeps group members current on each other's issues, problems, and progress, and allows managers to analyze the work flow across projects or departments.
- A Client Tracking template gives a

sales team a central repository for information on clients. The database can include data on key company contacts, type of business, and location. Any team member who works with a client contributes to the database. The main view is an alphabetical client list; other views sort the data by account manager, client location, and account status.

- A Service Request template allows a service department to track work requests. An MIS department, for example, can track requests for hardware and software support and for equipment repairs. Managers can then identify service patterns and equipment trends throughout their company.

- A Newswire template consolidates, sorts, summarizes, and distributes news to work groups. News may be a company newsletter or the public news on a group's industry, competition, or clients. Group members can "discuss" the news with each other by entering a comment or additional information. The main view is a chronological list of news items; news may also be viewed by topic or by source.

Notes runs on 3Com's 3+Share version 1.31 (DOS) and 3+Open (OS/2) networks, on Novell SFT NetWare version 2.15 or higher, on IBM PC LAN Program 1.2 and 1.3 (DOS), and on all networks compatible with IBM OS/2 Extended Edition 1.1. Network PCs must be IBM PC AT, PS/2, Compaq, or compatible computers. Under DOS, they must have 640K of RAM, DOS 3.1 or higher, and *Microsoft Windows* version 2.1 (a run-time version is supplied). Under OS/2, they must have 4 megabytes of RAM, OS/2 Standard Edition or Extended Edition 1.1, and OS/2 Presentation Manager. At press time, Lotus had not set a price for *Notes*.



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Sales&Service Activity Reporting - Summ
Sales Highlights
  Competition
    LanVision has constant promotions              Exec
    RView now has a full time account rep    SO    Sup    Exec
    SmartSoft was sufficiently immobilized by t  NY  Rel  High
    LanVision is bringing their roadshow to the  NW  Rel  Med
  Sales Success
    Rendezvous is becoming successful at H   NW    Corp   Exec
    SI Systems has signed a Resellers Master SO    Rel    High
    Rendezvous-Unix continues to grow at Ban NY    Corp   Med
    Boston Trust Bank has standardized on R  NE    Corp   Med
Issues
  Business
    Rendezvous 2 upgrade and networking pl   NE    Sup    Exec
    Alternate methods of distribution        NE    Rel    Exec
    We'd like to see another Retail Training C GL  Rel    High
    Successfully implemented 3rd Reseller Tr NE    Rel    High
    Some resellers sell primarily networks an Cen  Rel    High
    Inside Sales reps would find it very helpful t NW Corp High
    Network Day for Resellers                SO    Rel    Med
  Customer
    Reaction to Rendezvous II announcements  SW    Corp   Exec
```

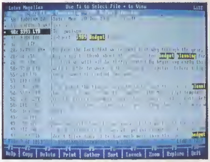
A *Notes* database can have any number of views. A view is a document index, selected and sorted by criteria you specify.

MORE MAGELLAN VIEWERS

Lotus Development Corp. announced additional viewers for *Lotus Magellan*, its text search and retrieval utility. A viewer allows *Magellan* to display the contents of a file as it appears in its native application. *Magellan* 1.0 shipped in April with viewers for many popular programs, including *1-2-3, Symphony, Lotus Manuscript, Lotus Agenda, WordPerfect, dBase,* IBM *DisplayWrite, XyWrite, Microsoft Word, WordStar*, and *MultiMate*.

The Bonus Viewer Disk contains updates for 10 of the original viewers, as well as a bunch of new viewers. The new viewers can display files from *Paradox* and *Quattro* (from Borland International), *WordPerfect* 4.2, *Framework* (from Ashton-Tate Corp.), *Q&A Write* (from Symantec Corp.), *Professional Write* (from Software Publishing Corp.), *Microsoft Excel*, and the word-processing files of *Enable* (from The Software Group).

There's also a viewer for files in Revisable Format Text (EBCDIC) and a viewer that lets *Magellan* display the contents of files compressed with the *PKzip* file-compression utility from PKware. That means you don't have to uncompress a file in order to see the contents or to gather a few paragraphs. In addition, the disk contains a viewer that lets you edit ASCII text files from within *Magellan*, which means you don't have to launch to another program to make simple changes.



Viewers link *Magellan* and DOS-based files so that *Magellan* can display a file as it appears in its native application.

The Bonus Viewer Disk will be sent free to all registered *Magellan* users. You can also download it from CompuServe (enter *go lotusb* at the exclamation-point prompt) or pick up a copy at selected dealers. *Magellan* retails for $195 and runs on IBM, Compaq, and compatible personal computers with a hard disk, 512K of RAM, and DOS 2.1 or higher.

LOTUS SPREADSHEET FOR TANDY DESKMATE

In October Lotus Development Corp. shipped *Lotus Spreadsheet for DeskMate*, a spreadsheet program that includes a run-time version of Tandy's *DeskMate* graphical user interface.

Lotus Spreadsheet for DeskMate offers integrated spreadsheet, database, and graphics capabilities. It stores files in the WK1 format, which is compatible with all releases of *1-2-3* and *Symphony*. However, the program does not work with *1-2-3* add-ins or with expanded memory, nor does it include a macro programming language.

Lotus Spreadsheet for DeskMate runs on all Tandy and other IBM-compatible

PCs with DOS 3.2 or higher and 512K of RAM. It is available for $219.95 at 7,000 participating Radio Shack stores and Tandy dealers in the United States. Lotus Development provides support, service, and warranty.

CD/INVESTMENT UPGRADE

CD/Investment: U.S. Equities is a major upgrade to CD/Investment, one of the Lotus One Source family of financial databases delivered on CD-ROM (compact disk, read-only memory). Current CD/Investment subscribers may upgrade free to the new version, which features easier access to financial data and advanced analysis, screening, and reporting capabilities.

With CD/Investment: U.S. Equities, investment and financial professionals can perform comparative financial analysis, merger and acquisition studies, portfolio analysis and reporting, and competitive comparisons.

"Our goal is to provide our customers with easy, consistent access to quality data and also with the power and flexibility to customize it," says Kirit Patel, general manager for One Source.

Toward that end, CD/Investment: U.S. Equities features expanded database capabilities and three methods for accessing data:

- Menu Access is designed to let any user screen the databases, isolate companies with specific financial characteristics, generate standard reports or graphs, and create and manage portfolios.
- *1-2-3* Access lets you retrieve financial data and company information directly into a *1-2-3* worksheet. Then you can use the several prepackaged applications that come with U.S. Equities to generate comprehensive financial reports, graphs, and technical analyses from within *1-2-3*.
- Programmatic Access is designed for those who want to develop customized applications.

To use CD/Investment: U.S. Equities, you need a '286- or '386-based IBM, Compaq, or compatible personal computer, 1 megabyte of RAM, and DOS 3.2 or 3.3. A CD-ROM reader is included with each One Source subscription.

A dozen databases are available as part of the U.S. Equities subscription. The product is updated weekly, but overnight updates of time-sensitive information, such as stock prices, are available via modem. The subscription prices begin at $20,000 per year for a single database. Discounts are available with the purchase of multiple copies of a single database, multiple databases, or other One Source products. A network version of the product will also be available.

YOU CAN SEND FAXES WITH LOTUS EXPRESS

A new enhancement package for *Lotus Express*, Lotus Development Corp.'s communications software for MCI Mail, allows users to send faxes directly from their PCs without a fax board.

Available now, Lotus's fax pack for *Express* uses MCI Mail's Fax Dispatch capabilities to allow users to send a fax to multiple fax machines simultaneously. The fax pack for *Express* has a suggested retail price of $10. For a copy, contact a participating Lotus-authorized dealer or call Lotus at 800-345-1043. ■

Talk to Us on CompuServe

After some delay (not of our making), you can now download from CompuServe the templates we have published in this year's issues.

We told you how to do it in the November issue, on page 87. Hope you clipped that page unless you're a CompuServe veteran already. But there's more.

Besides downloading template files, you can also leave messages for us—or for anyone else—about the templates or about any other topic having to do with the magazine. We'll try to respond promptly to queries and to acknowledge suggestions. Please do not ask us questions that would be more properly addressed to the product support people at Lotus Development Corp.

To leave a message, enter 2 for MESSAGES at the main menu for the Lotus Spreadsheet Products Forum. A Messages menu will appear. Enter 4 for COMPOSE. Then type your message and end it as instructed by CompuServe. At the *To* prompt, enter *LOTUS magazine*. That's the search string we'll use to find your messages. You'll then be asked for the subject. Enter an appropriate phrase. If you're referring to a previous message about the magazine, use the same subject. That's the search string we (and others) use to follow the discussion.

FRAN O'NEILL

To read messages concerning *LOTUS* magazine, go to the Messages menu and choose either 1 for SELECT or 2 for READ.

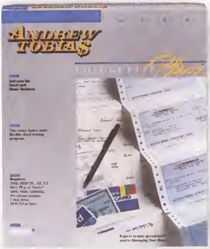
If you choose SELECT, you will be asked to specify a section. Enter 10. You then get the first page of a list of message topics having to do with the magazine. If you see one of interest, enter its number at the prompt. You will see the first message on that topic and can see the rest if you wish. When you hit Return after the last message, you return to the list of message topics and can choose another one.

If you choose READ, you will again be asked to specify a section. Enter 10. You will then be asked to specify a subject. You can enter a keyword, or keywords, to restrict the topics you see—just as you do in browsing through a library of files. Or you can enter *all*. If you wish to capture messages, set your communications program accordingly.

If you have decided to visit *us* on CompuServe, you will surely want to visit other sections of the Lotus Spreadsheet Products Forum, where you can find many other helpful files and exchange messages with experienced spreadsheet users.

Just choose the appropriate section from that forum's main menu. If you use nonspreadsheet products from Lotus, you will want to visit the Lotus Stand-Alone Products Forum as well. Enter *go lotusb* at the main CompuServe prompt or at any other CompuServe prompt that ends with an exclamation point. ○

GET ORGANI$ED!



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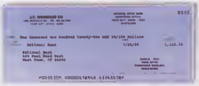

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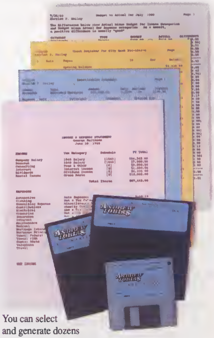

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START HERE

MORE ON DATABASE MANAGEMENT

You can use criteria and Data Query commands to manipulate your database.

BY DANIEL GASTEIGER

This installment of Start Here wraps up a four-part introduction to *1-2-3*'s database-management facility. It explores two more Data Query commands and reveals a shortcut for performing repeated query operations. A future article will address the database statistical functions.

As readers of this column have learned, you can use Criterion ranges to find or copy selected information. Criterion ranges can also help you remove unwanted information from a database, list examples of each category of information stored in the database, and perform statistical analysis on information stored in a database.

If you haven't followed the last three installments, you should refer to them before proceeding, unless you already understand Criterion-range fundamentals.

RECYCLE YOUR WORKSHEET

If you saved the practice worksheet from last month's column, you can use it as the basis for this month's exercises. If you don't have last month's worksheet, skip ahead to the "Build the Worksheet" section.

Retrieve the worksheet and erase the second row of the Criterion range (A2..D2). Erase the Output range's field names and the records in the cells below them. If you saved your worksheet after last month's final exercise, this is range A15..C17.

Now copy the field names from range A4..D4 to cell A15. Specify the new Output range by pressing slash, selecting Data Query Output, and indicating range A15..D15. This new Output range includes all the field names from the corresponding database Input range. Remember that all data below a one-row Output range will be erased by subsequent Data Query commands. Now, skip ahead to the "One More Time" section.

BUILD THE WORKSHEET

The illustration shows a database Input range and its associated Criterion range and Output range.

To create the database Input range, enter the labels shown in row 4 and in range A5..B12 of the model. Next, enter the values in range C5..D12. Omit the dollar signs and commas as you enter the values. But after you have entered them, use the Range Format Currency command to assign a currency format with zero decimal places.

You also need to create a Criterion range and an Output range. Copy the labels from range A4..D4 to cell A1. Then copy range A4..D4 to cell A15.

Now use the Data Query commands to assign the database Input, Criterion, and Output ranges: Select /Data Query Input and indicate range A4..D12. Select Criterion and indicate range A1..D2. Then select Output and indicate range A15..D15. Finally, select Quit.

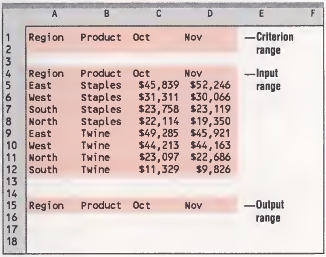
If any of the preceding tasks were new to you or confusing, stop now and review the previous Start Here columns. If you're comfortable with what you've done so far, it's time to enter a criterion and extract some records from the database.

ONE MORE TIME

Let's briefly review Criterion ranges and the Data Query Extract command. You'll need a good understanding of these to learn the new techniques ahead.

Suppose that you want to examine every record that contains the label *East* in the *Region* field. Move the cell pointer to cell A2 and enter *East*. Then select /Data Query Find. The cell pointer expands and highlights the record in row 5, the first of the eastern region's records.

You can find the next record for the eastern region simply by pressing the DownArrow key. When you are



	A	B	C	D	E	F
1	Region	Product	Oct	Nov	—Criterion range	
2						
3						
4	Region	Product	Oct	Nov	—Input range	
5	East	Staples	$45,839	$52,246		
6	West	Staples	$31,311	$30,066		
7	South	Staples	$23,758	$23,119		
8	North	Staples	$22,114	$19,350		
9	East	Twine	$49,285	$45,921		
10	West	Twine	$44,213	$44,163		
11	North	Twine	$23,097	$22,686		
12	South	Twine	$11,329	$9,826		
13						
14						
15	Region	Product	Oct	Nov	—Output range	
16						
17						
18						

finished examining the records, press the Return key.

To copy all the records for the eastern region from the database to the Output range, select Extract from the Data Query menu, then select Quit. When you select Extract, *1-2-3* compares the entry or entries in the Criterion range with the first entry of the database. If there is an exact match, *1-2-3* copies the record from the database to the first row of the Output range. If there is no match, *1-2-3* doesn't copy the entry.

1-2-3 then compares the second database record with the entries in the Criterion range. Again, if there is a match, *1-2-3* copies the record. *1-2-3* continues to copy every matching record to the Output range.

UNIQUE AND DELETE

By now you should know how to use criteria in conjunction with the Data Query Find and Data Query Extract commands. Two more commands on the Data Query menu should also be of interest to you.

The Data Query Delete command eliminates unwanted records, while the Data Query Unique command shows what categories of entries exist in the database.

Assume that you want to delete records that show less than $10,000 in November sales. Instead of manually locating and removing each of these records, you can use the Data Query Delete command.

Start by erasing the label in cell A2. Then move the cell pointer to cell D2 and enter the formula +D5<10000. This criterion tells *1-2-3* to select only the records whose *Nov* field contains a value less than 10,000. Confirm this by selecting /Data Query Find. *1-2-3* highlights the database's eighth record. Because this is the last record in the database, there is no need to press the DownArrow key to see if other records match the criterion. Press Return to end the command.

Remember to issue the Data Query Find or Data Query Extract command before you issue a Data Query Delete command. This will prevent you from accidentally removing the wrong records. If your Criterion range does not correctly identify the records to delete, modify and test it until it does. Another good precaution is to save your worksheet before you delete records. If you make a mistake, you can retrieve the version that you saved.

Now select Delete from the Data Query menu. *1-2-3* gives you the choice of canceling or proceeding with the Delete command. Select Delete from the menu to execute the command. The selected record vanishes from the database. *1-2-3* deleted the record and the Input range has shrunk to encompass only rows 4 through 11. *1-2-3* adjusts the Input range's references automatically to account for deleted records. Confirm this by selecting Input. When you see that the Input range has indeed contracted, press Return and select Quit.

The Data Query Unique command helps you to see an example of each type of entry in a database. Like the Data Query Extract command, it copies records from the database into the Output range. The Data Query Unique command relies on more than just a criterion to select the records that it copies. The command copies only one entry for each category of records in the database.

You identify the breadth of information by which *1-2-3* identifies a category when you assign an Output range. Currently, the Output range contains the names of all four fields of the database. This tells *1-2-3* that all four fields together constitute a category. So for any two records to be in the same category, they must match exactly.

The database you're working with has no records that match exactly, so each record defines its own category. If you select Unique from the Data Query menu, *1-2-3* will copy every record to the Output range.

Try this instead: Use the Range Erase command to remove the criterion from cell D2, then erase range A16..D17. Reduce the Output range to include only the field name in column B by selecting /Data Query Output and indicating cell B15. Now select Unique.

Two entries appear in the Output range. By reducing the size of the Output range, you reduce the number of fields by which *1-2-3* identifies a category. Within the *Product* column of the database, there are only two categories of data—staples and twine.

The Data Query Unique command serves two main purposes. With an Output range that matches the Input range, you can easily ferret out duplicate records from your database. When you narrow down the Output range to only one or two fields, you can quickly determine what types of entries the particular field or fields contain.

When you press the QUERY key (F7 on most computers), *1-2-3* repeats the data-query operation you last performed. This is particularly useful when you wish to examine selected records and then change the selection criteria to examine other records.

The following steps demonstrate the QUERY key's convenience. Select Output from the Data Query menu and indicate range A15..D15. Select Quit to return to Ready mode, then enter the label *North* in cell A2. Select /Data Query Extract. *1-2-3* copies to the Output range all the records that contain *North* in the *Region* field.

Select Quit to return to Ready mode, then change the criterion. Because you haven't moved the cell pointer, you can simply type *West* and press Return. Then, rather than access the Data Query menu, you can simply press the QUERY key. *1-2-3* erases the Output range and copies new records into it. Change the criterion once more by entering *South* in cell A2, then press QUERY one last time.

The QUERY key can be used only from Ready mode. And it repeats the data-query operation you just performed: Find, Extract, Delete, or Unique. If your last Data Query command was Data Query Delete and you want to find records, make sure you use the Data Query Find command instead of pressing the QUERY key. Otherwise, you'll delete the records that you want to find. ■

Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to* LOTUS.

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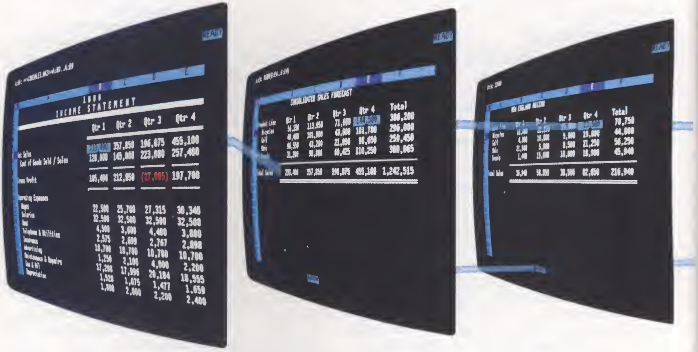

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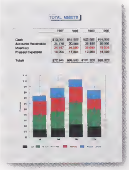

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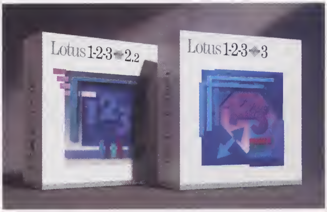

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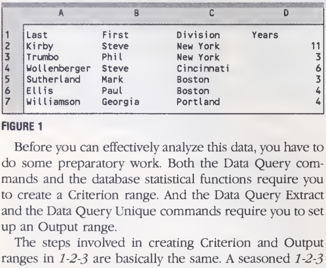
SET UP YOUR DATABASES AUTOMATICALLY

Create data query ranges with a macro that does it all for you.

BY NICK DELONAS

One of the most useful features of *Lotus HAL* is its ability to automatically set up a database for *1-2-3* data queries. You just tell it where the database is, and it generates the Criterion range and the Output range, and it sets everything up for the Data Query commands. That can save you a lot of time if you create databases frequently. But you may not use *HAL*. If you don't, you can create a macro that does the same job.

Let's say you have the following database in a worksheet:



	A	B	C	D
1	Last	First	Division	Years
2	Kirby	Steve	New York	11
3	Trumbo	Phil	New York	3
4	Wollenberger	Steve	Cincinnati	6
5	Sutherland	Mark	Boston	3
6	Ellis	Paul	Boston	4
7	Williamson	Georgia	Portland	4

FIGURE 1

Before you can effectively analyze this data, you have to do some preparatory work. Both the Data Query commands and the database statistical functions require you to create a Criterion range. And the Data Query Extract and the Data Query Unique commands require you to set up an Output range.

The steps involved in creating Criterion and Output ranges in *1-2-3* are basically the same. A seasoned *1-2-3* user would typically perform the following 11 operations:

1. Give the Database range a name.

2. Use the Range Name Labels Down command to assign the database field names, or column titles, as range names for each of the cells in the first record of the database. That way you can create criterion formulas like +years>6 rather than +D2>6.

3. Copy the field names from the top of the Database range to the upper-left corner of the area where you want to put the Criterion range.

4. Give the Criterion range a name.

5. Format the cells in the Criterion range as text so that they display formulas rather than the results of formulas. For example, you would probably want to see the formula +years>6 rather than its resulting value, 1.

6. Find a place where there's enough room for the Output range, making sure that there is no data below it that the Data Query Extract command can destroy.

7. Copy the field names from the Database range to the upper-left corner of the area where you want to put the Output range.

8. Give the Output range a name.

9. Assign the Database range as the data query Input range.

10. Assign the Criterion range as the data query Criterion range.

11. Assign the Output range as the data query Output range.

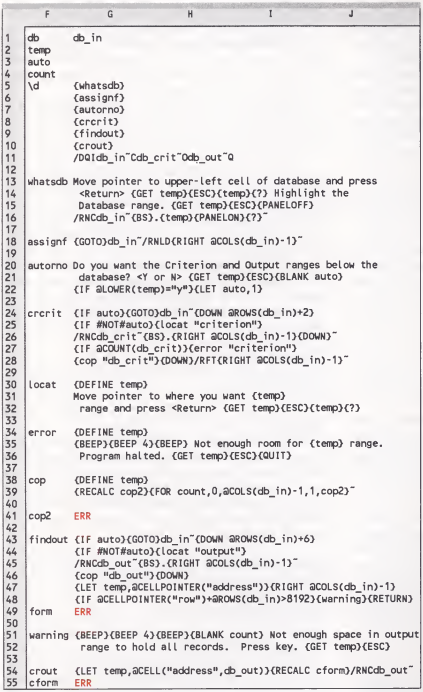
Now this isn't that much work, and you might not need a macro to do it for you. But if you're setting up databases on a regular basis, including a macro in your library that automates most of these steps is worth the trouble—especially since we've done most of the work for you. At the end of this article, we'll show you how to access the macro in any worksheet.

THE MACRO

Before you create the macro, enter the labels and values shown in the example database in figure 1. Then enter labels as shown in figure 2. Omit, for now, the text printed in red. That is the result of string formulas that we'll enter in a moment. Note that the labels in cells G14, G15, G21, G32, G36, and G52 all begin with a space character.

Use the Range Name Labels Right command to assign the labels in range F1..F55 as range names for the adjacent cells in column G. Then enter the following formulas:

Cell	Formulas
G41	+“{PUT ”&@CELL(“contents”,temp)&“,count, 0,@INDEX(db_in,count,0)}”
G49	+“{RECALC form}{IF @COUNT(”&temp& “..”&@LEFT(@CELLPOINTER(“address”), @FIND(“$”,@CELLPOINTER (“address”), 1))&@STRING(@CELLPOINTER(“row”)+ @ROWS(@@(DB)),0)&“)}{error ””output””}”
G55	+temp&“..”&@LEFT(@CELLPOINTER (“address”),@FIND(“$”, @CELLPOINTER(“address”),1))&



```
        F         G            H              I              J
1   db      db_in
2   temp
3   auto
4   count
5   \d      {whatsdb}
6           {assignf}
7           {autorno}
8           {crcrit}
9           {findout}
10          {crout}
11          /DQIdb_in~Cdb_crit~Odb_out~Q
12
13  whatsdb Move pointer to upper-left cell of database and press
14           <Return> {GET temp}{ESC}{temp}{?} Highlight the
15           Database range. {GET temp}{ESC}{PANELOFF}
16          /RNCdb_in~{BS}.{temp}{PANELON}{?}~
17
18  assignf {GOTO}db_in~/RNLD{RIGHT @COLS(db_in)-1}~
19
20  autorno Do you want the Criterion and Output ranges below the
21           database? <Y or N> {GET temp}{ESC}{BLANK auto}
22          {IF @LOWER(temp)="y"}{LET auto,1}
23
24  crcrit  {IF auto}{GOTO}db_in~{DOWN @ROWS(db_in)+2}
25          {IF #NOT#auto}{locat "criterion"}
26          /RNCdb_crit~{BS}.{RIGHT @COLS(db_in)-1}{DOWN}~
27          {IF @COUNT(db_crit)}{error "criterion"}
28          {cop "db_crit"}{DOWN}/RFT{RIGHT @COLS(db_in)-1}~
29
30  locat   {DEFINE temp}
31          Move pointer to where you want {temp}
32           range and press <Return> {GET temp}{ESC}{temp}{?}
33
34  error   {DEFINE temp}
35          {BEEP}{BEEP 4}{BEEP} Not enough room for {temp} range.
36           Program halted. {GET temp}{ESC}{QUIT}
37
38  cop     {DEFINE temp}
39          {RECALC cop2}{FOR count,0,@COLS(db_in)-1,1,cop2}~
40
41  cop2    ERR
42
43  findout {IF auto}{GOTO}db_in~{DOWN @ROWS(db_in)+6}
44          {IF #NOT#auto}{locat "output"}
45          /RNCdb_out~{BS}.{RIGHT @COLS(db_in)-1}~
46          {cop "db_out"}{DOWN}
47          {LET temp,@CELLPOINTER("address")}{RIGHT @COLS(db_in)-1}
48          {IF @CELLPOINTER("row")+@ROWS(db_in)>8192}{warning}{RETURN}
49  form    ERR
50
51  warning {BEEP}{BEEP 4}{BEEP}{BLANK count} Not enough space in output
52           range to hold all records.  Press key. {GET temp}{ESC}
53
54  crout   {LET temp,@CELL("address",db_out)}{RECALC cform}/RNCdb_out~
55  cform   ERR
```

FIGURE 2

@IF(COUNT,@STRING(@CELLPOINTER
("row") + @ROWS(@@(DB)),0),
"8192")&"~"

To run the macro, hold down the MACRO key (Alt on most computers) and press D.

The macro asks you to move the cell pointer to the upper-left corner of the Database range and then press Return. Move the cell pointer to cell A1. If the cell pointer is already in the upper-left corner of the Database range, just press the Return key twice.

The macro anchors the cell pointer and asks you to highlight the Database range. You should press the DownArrow key six times and press the RightArrow key three times to highlight range A1..D7. Then press Return.

The macro asks you if you want the Criterion and Output ranges placed below the Database range. If you press the N key, the macro asks you to move the cell pointer to where you want the macro to put the Criterion range. It then asks you to move the cell pointer to where you want it to put the Output range. If you press the Y key, the macro automatically creates the Criterion and Output ranges below the Database range. In this case, you should press Y so that the macro will position the Criterion and Output ranges automatically.

The macro creates the ranges. If there isn't enough room for the Criterion or the Output range, the macro will let you know, and it will stop.

HOW THE MACRO WORKS

The logic of the entire macro program is revealed in *\d*. Here's how it works:

{whatsdb} calls the *whatsdb* routine. The *whatsdb* routine finds out where the database is and assigns it the range name *db_in*.

{assignf} calls the routine *assignf*. This moves the cell pointer to the upper-left corner of range *db_in*. The macro then issues a Range Name Labels Down command and highlights the field names that are in the database. This assigns the field names as range names for each of the adjacent cells in the second row of the *db_in* range.

{autorno} calls the routine named *autorno*. It asks you whether you want the Criterion and Output ranges to be assigned automatically.

{crcrit} calls the routine *crcrit*. This creates the Criterion range by using the field names from the Database range. It assigns the range name *db_crit* to identify the Criterion range.

{findout} calls the routine *findout*. This creates the Output range and names it *db_out*.

{crout} calls the routine *crout*. This re-creates the *db_out* range, making it large enough to include all the records in the Database range, *db_in*.

/DQIdb_in~Cdb_crit~Odb_out~Q issues a Data Query command and assigns *db_in* as the Input Range, *db_crit* as the Criterion range, and *db_out* as the Output range.

The *whatsdb* Routine

Move pointer to upper-left cell of database and press types the first part of a prompt in the control panel.

<Return> {GET temp}{ESC}{temp}{?} Highlight the finishes typing the prompt that asks you to move the cell pointer to the upper-left corner of the Database range. The macro waits for you to press a key, and it stores that keystroke in the cell named *temp*. The macro uses the {ESC} command to erase the characters from the control panel. Then it passes your keystroke to *1-2-3* by calling the cell named *temp* as a routine.

If you pressed the LeftArrow key when the macro prompted you to move the cell pointer, *temp* will contain the command {LEFT}. Because the macro calls *temp* as a routine, you don't notice that your keystroke served to restart the macro after the prompt. You just see the cell pointer move in response to your keystroke. Note that the macro doesn't include error checking on your keystroke here. Press only a keypad key: Home, PgUp, PgDn, End, or one of the Arrow keys.

After calling *temp*, the macro pauses for your input. The {?} command lets you use the Arrow keys to move the cell pointer.

When you press Return, the macro assumes the cell pointer is at the top-left corner of the Database range. It then starts another prompt.

Database range. {GET temp}{ESC}{PANELOFF} finishes the prompt that asks you to highlight the Database range. When you press a key, the macro stores that keystroke in *temp*. Next, it uses the {ESC} command to clear the control panel. The macro then freezes the control panel.

/RNCdb_in~{BS}.{temp}{PANELON}{?}~ issues a Range Name Create command. The macro starts creating the range *db_in* in the current cell. It calls the *temp* routine, which uses your keystroke as the starting point for highlighting the range. The macro then turns the control panel back on and pauses for you to continue highlighting the Database range. When you press Return, the macro finishes the Range Name Create command, naming the range you highlighted *db_in*.

The *autorno* Routine

Do you want the Criterion and Output ranges below the starts a prompt in the control panel.

database? <Y or N> {GET temp}{ESC}{BLANK auto} finishes the prompt that asks whether you want the Criterion and Output ranges to be placed below the Database range. The macro pauses for you to answer and stores your keystroke in *temp*. Then the macro clears the control panel and erases the contents of the cell named *auto*.

{IF @LOWER(temp)="y"}{LET auto,1} enters 1 in *auto* if you pressed Y in response to the prompt.

The *crcrit* Routine

{IF auto}{GOTO}db_in~{DOWN @ROWS(db_in) +2} positions the cell pointer three rows below the bottom of the Database range if *auto* contains a 1.

{IF #NOT#auto}{locat "criterion"} calls the *locat* routine, using "criterion" as an argument, if *auto* doesn't contain a 1. The *locat* routine asks you where you want the macro to put the Criterion range.

/RNCdb_crit~{BS}.{RIGHT @COLS(db_in)-1} {DOWN}~ issues a Range Name Create command. The macro creates the range *db_crit*, making it two rows deep and as wide as the database.

{IF @COUNT(db_crit)}{error "criterion"} checks for any values or labels in the *db_crit* range. If the macro finds any entries, it calls the *error* routine by using "criterion" as an argument. The *error* routine tells you there isn't enough room for the Criterion range and halts macro processing.

{cop "db_crit"}{DOWN}/RFT{RIGHT @COLS(db_in) -1}~ calls the *cop* subroutine using "db_crit" as an argument. In this case, the *cop* subroutine copies the field names from the Database range to the Criterion range. The macro then issues a /Range Format Text command.

The *locat* Routine

{DEFINE temp} stores the argument from the calling routine in *temp*.

Move pointer to where you want {temp} starts typing a prompt in the control panel.

range and press <Return> {GET temp}{ESC} {temp}{?} finishes typing the prompt that asks you to move the cell pointer to where you want the macro to create the new range. The prompt specifies the range it wants you to position by calling *temp* as a routine. The cell named *temp* contains either *criterion* or *output*, depending on the argument of the call.

The *error* Routine

{DEFINE temp} stores the argument from the calling routine in *temp*.

{BEEP}{BEEP 4}{BEEP} Not enough room for {temp} range. sounds three beeps and starts entering a prompt in the control panel.

Program halted. {GET temp}{ESC}{QUIT} finishes typing the prompt that tells you there isn't enough room for the range in question. The prompt specifies either the Criterion range or the Output range, depending on the argument of the call. The macro waits for you to press a key. It uses {ESC} to clear the control panel and then halts macro processing.

The *cop* and *cop2* Routines

{DEFINE temp} stores the argument from the calling routine in *temp*.

{RECALC cop2}{FOR count,0,@COLS(db_in)-1,1, cop2}~ recalculates the string formula in the cell named *cop2*. The macro then calls the routine *cop2* as many times as there are columns in range *db_in*.

The string formula in *cop2* takes the form of a {PUT} command. It copies one of the field names from the database to a cell in the range identified in *temp*. Using an @INDEX formula, the macro copies the field name to the Criterion or Output range, with an offset equivalent to the value in *count*.

The *findout* Routine

{IF auto}{GOTO}db_in~{DOWN @ROWS(db_in)+6} moves the cell pointer seven rows below the bottom of range *db_in* if *auto* contains a 1.

{IF #NOT#auto}{locat "output"} calls the *locat* routine by using "output" as an argument if *auto* doesn't contain a 1. In this case, the *locat* routine asks you where you want the macro to put the Output range.

/RNCdb_out~{BS}.{RIGHT @COLS(db_in)−1}~ creates the *db_out* range. The macro makes *db_out* one row deep and as wide as the database.

{cop "db_out"}{DOWN} calls the routine *cop* with "db_out" as an argument and then moves the pointer down one row. In this case, the *cop* routine copies the field names from the Database range *db_in* to range *db_out*.

{LET temp,@CELLPOINTER("address")}{RIGHT @COLS(db_in)−1} enters the current cell address in *temp*. The macro then moves the pointer to what will be the last column in the Output range.

{IF @CELLPOINTER("row")+@ROWS(db_in) >8192}{warning} {RETURN} calls the *warning* routine if there aren't enough rows below the cell pointer to contain the entire database. In that case, the macro returns control to the calling routine.

The string formula in *form* recalculates itself. Then, if range *db_out* contains any entries, the macro calls the *error* routine by using "output" as an argument.

This is how the *warning* and *crout* routines work:

{BEEP}{BEEP 4}{BEEP}{BLANK count} Not enough space in output sounds three beeps and starts a prompt in the control panel.

range to hold all records. Press key. {GET temp} {ESC} finishes typing the prompt that tells you there isn't enough room in the Output range to hold all the database records. The macro then pauses. When you press a key, the macro clears the control panel.

{LET temp,@CELL("address",db_out)}{RECALC cform}/RNCdb_out~ enters in *temp* the address of the cell in the upper-left corner of range *db_out*. The macro then recalculates the formula in *cform*. The macro uses the string formula in *cform* to re-create range *db_out* so that it is as large as range *db_in*.

IMPORTING THE MACRO

Create a worksheet file that contains the macro: Select /File Xtract Formulas and enter *datamcro*. Indicate range F1..G55 and press Return.

When you're ready to set up a new database, find a blank area of the current worksheet and import the DATAMCRO file. Select /File Combine Copy Entire-File and enter *datamcro*. Reassign the macro's range names with the Range Name Labels Right command.

If you're using *1-2-3* Release 2.2, you can save this macro in Hyperspace—memory outside the current worksheet. Select APP4 (Alt-F10 on most computers) and then select Attach. Enter *macromgr* and select No-Key. Select Invoke and choose Macromgr from the menu. Select Save, enter *database*, indicate range F1..G55, and press Return. Then select No.

Next time you create a database, you can use the macro by attaching the MACROMGR file as you just did. After you invoke MACROMGR, choose Load and select DATABASE.MLB. Select Quit and then run the macro by pressing MACRO-D.

If you're using *1-2-3* Release 3, bringing the macro into your worksheet is not much different from bringing it into a Release 2.01 worksheet. You combine the worksheet that contains the macro. You have the option, however, of calling the macro into another worksheet in the current file. Select /Worksheet Insert Sheet After and press Return to accept the default of 1. Select /File Combine Copy Entire-File and enter *datamcro*. Then reassign the macro's range names with the Range Names Labels Right command. Press PREVIOUS-SHEET (Ctrl-PgDn on most computers), and you're ready to use the macro. ■

Some Useful Conventions

Our examples use uppercase letters for macro commands and lowercase letters for range names and addresses used by the macros (/XGaddress~). Whenever possible, range names appear to the left of the named cells. This helps to identify named cells and is especially useful if you want to use the File Combine command to copy a macro from one worksheet into another. You can reassign all the range names in one step by using the Range Name Labels Right command sequence.

Remember, when you enter macro steps that start with a slash (/), a label-prefix character such as a backslash (\), or any arithmetic operators (+, −, *, etc.), place an apostrophe (') before the entry or you may get unexpected results.

Why Use Range Names?

When you type a command as a label, cell references within the command are meaningless to *1-2-3* until it processes the macro. For example, if your macro uses the command /Cb3~h20~ to copy information from a table and you move the table to another part of the worksheet, your macro no longer copies the proper information. If, however, you have named the cells *source* and *destination* and the macro command is /Csource~destination~, moving the table that contains these cells does not adversely affect the macro. It's also much easier to edit a worksheet later if you've used range names instead of cell references in your macro code.

FOR DEVELOPERS

WHEN TO AVOID THE {BRANCH} COMMAND

Replace branches with calls to make your macros more readable and more expandable.

BY NICK DELONAS

The {BRANCH} command is a handy tool for quick-and-dirty macro solutions. But when you're developing complex macros on a large scale, lots of branches make your programs sloppy and unstructured. These macros are difficult to understand and hard to modify.

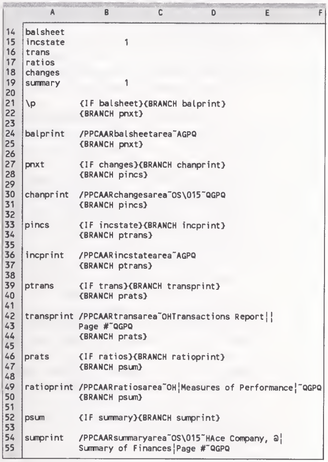
The problem is that, unlike some programming languages, *1-2-3* and *Symphony* do not impose a logical structure on your program design. Pascal and C, for example, force you into structured programming. In those languages a single master routine contains the overall logic of the program. That master routine typically calls functionally independent subroutines or modules. A subroutine is functionally independent when any other subroutine can call it. For example, you might create a subroutine that converts a date string to a date value in the C language. Then any other subroutine you create in your program can use that routine to convert a date string. So you never have to rewrite the routine.

You can create the same kind of routine in *1-2-3* and *Symphony*. But it's up to you to impose an overall structure. Few macro developers have enough discipline to do that. Instead, we use the {BRANCH} command to spin a web of unreadable spaghetti code. The result is a macro system that no one can follow or modify effectively—probably not even its creator.

Fortunately, most branching is unnecessary. With a little thought, you can design macros that use calls instead of branches. To create a subroutine call, you simply enclose the subroutine's range name in braces. When the spreadsheet encounters such a call during macro processing, it temporarily stops executing the calling routine and runs the subroutine. After running the subroutine, the spreadsheet returns macro control to the calling routine. Macro processing then continues with the command immediately following the subroutine call.

THE WRONG WAY TO WRITE MACROS

Take a look at the example in figure 1. This macro prints one or all of six reports. It establishes which report to print by first checking for nonzero values in range B14..B19. When it finds one, it prints a specific area of the worksheet. There are six named ranges (not shown) that it can print: *balsheetarea, changesarea, incstatearea, transarea, ratiosarea*, and *summaryarea*. Range B14..B19 contains six named cells: *balsheet, incstate, trans, ratios, changes*, and *summary*. In the figure, the 1 in *incstate* (cell B15) tells the macro to print the associated range named *incstatearea*. Since *balsheet* (cell B14) doesn't contain a 1, the macro will not print the associated range named *balsheetarea*.



```
            A           B           C           D           E           F
14  balsheet
15  incstate          1
16  trans
17  ratios
18  changes
19  summary           1
20
21  \p         {IF balsheet}{BRANCH balprint}
22             {BRANCH pnxt}
23
24  balprint   /PPCAARbalsheetarea~AGPQ
25             {BRANCH pnxt}
26
27  pnxt       {IF changes}{BRANCH chanprint}
28             {BRANCH pincs}
29
30  chanprint  /PPCAARchangesarea~OS\015~QGPQ
31             {BRANCH pincs}
32
33  pincs      {IF incstate}{BRANCH incprint}
34             {BRANCH ptrans}
35
36  incprint   /PPCAARincstatearea~AGPQ
37             {BRANCH ptrans}
38
39  ptrans     {IF trans}{BRANCH transprint}
40             {BRANCH prats}
41
42  transprint /PPCAARtransarea~OHTransactions Report¦¦
43             Page #~QGPQ
44             {BRANCH prats}
45
46  prats      {IF ratios}{BRANCH ratioprint}
47             {BRANCH psum}
48
49  ratioprint /PPCAARratiosarea~OH¦Measures of Performance¦~QGPQ
50             {BRANCH psum}
51
52  psum       {IF summary}{BRANCH sumprint}
53
54  sumprint   /PPCAARsummaryarea~OS\015~HAce Company, @¦
55             Summary of Finances¦Page #~QGPQ
```

FIGURE 1

The user runs this macro by holding down the MACRO key (Alt on most computers) and pressing P.

continued on page 37

Once again, Compaq makes a sizeable contribution to personal computing.

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and weighs ju

es 8½ by 11 inches
t 6 pounds.

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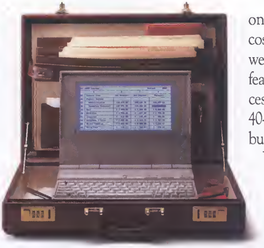
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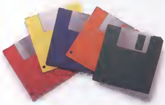
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FOR DEVELOPERS *continued from page 32*

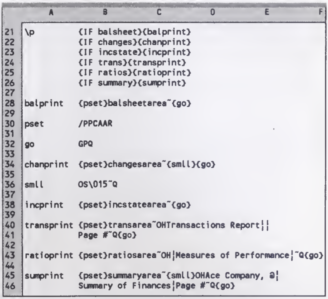
THE PROBLEMS WITH BRANCHING

Though the macro in figure 1 works, its logic isn't completely clear. This may not be the worst case of spaghetti code you've ever seen, but even so, reading through the macro is confusing. And all the branches make this model difficult to expand. You would have trouble writing other macros that use these subroutines because each subroutine contains a {BRANCH} command. The branches force the spreadsheet to pass control down a rigidly defined path.

Even if expanding this macro is not a concern, its readability is. Imagine that this macro is part of a thousand-line macro system that is riddled with {BRANCH} commands. Macro programmers who create such a labyrinth of branches often have trouble following their own programs when they go back to modify them.

The way to eliminate this problem is to avoid using the {BRANCH} command altogether. Consider the following reconstruction of the spaghetti-code macro shown in figure 1.

Now the macro is readable. The *\p* routine contains the logic of the program. You can read through the commands sequentially and easily understand how the macro works.



```
             A          B          C          D          E          F
21  \p          {IF balsheet}{balprint}
22              {IF changes}{chanprint}
23              {IF incstate}{incprint}
24              {IF trans}{transprint}
25              {IF ratios}{ratioprint}
26              {IF summary}{sumprint}
27
28  balprint    {pset}balsheetarea~{go}
29
30  pset        /PPCAAR
31
32  go          GPQ
33
34  chanprint   {pset}changesarea~{smll}{go}
35
36  smll        OS\015~Q
37
38  incprint    {pset}incstatearea~{go}
39
40  transprint  {pset}transarea~OHTransactions Report¦¦
41              Page #~Q{go}
42
43  ratioprint  {pset}ratiosarea~OH¦Measures of Performance¦~Q{go}
44
45  sumprint    {pset}summaryarea~{smll}OHAce Company, @¦
46              Summary of Finances¦Page #~Q{go}
```

FIGURE 2

Not only is the macro easier to understand, but each of the subroutines is now available to other macros. If, for example, you write another macro that also needs to print the balance-sheet portion of this worksheet, you can simply include the macro call command {balprint}. Your macro can then proceed, say, to change the values in the balance sheet and print it again with another call to the *balprint* routine.

Of course, in some situations a {BRANCH} command makes perfect sense—for example, in a branch to an error routine. Otherwise, avoid using branches when a call will work, and you will find maintaining your models is much easier. ■

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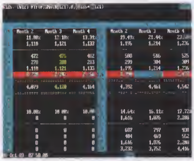
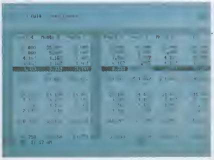
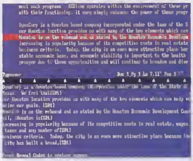


SPREADSHEETS / DATABASE



LAPTOP



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To Control Production, Point and Shoot

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and selection tables make
1-2-3 work for
machine operators.

JEFFREY SMITH

HOW TO USE THE TEMPLATE

BY NICHOLAS J. LOSOLE

To cut production costs, more and more manufacturers are turning to a technique known as just-in-time. This means that suppliers deliver parts direct to production lines just before the parts are needed. Done right, this slashes the amount of inventory you have to carry.

Such a change, though, makes it imperative that manufacturing managers receive production data as near to real time as possible. That can't happen with older systems of factory scheduling and control that run on mainframe computers, work in batch mode, and rely on data two to four weeks old.

An alternative is to pick up production data directly from factory machine stations and feed it into a spreadsheet for instant analysis. In this and subsequent articles, I will describe such a system—one that is similar to existing prototypes and based on *1-2-3* or *Symphony*. In this first article, I will show how you can design a friendly, efficient "front end"—a *1-2-3* template that a machine operator can easily use to enter production data on the spot. Later we'll see how to automate data entry and how to analyze the data that's collected.

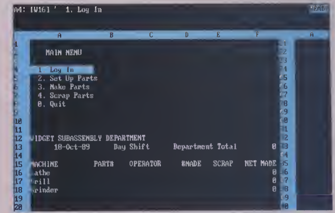
PCs ON THE FACTORY FLOOR

The need for simpler, more responsive computer systems in manufacturing has opened the floodgates for PCs—and not just in the production-control office. More than a million PCs are now on factory floors in the United States.

But a PC alone cannot improve manufacturing productivity. The link between real-time performance and the people in the front office who must analyze it is critical. That link, as we will show in future articles, can be a system of automatic counting devices and communication paths. Or, as in this article, it can be the machine operator.

In either case, the spreadsheet is a nat-

Nicholas J. Losole, a former manager of factory-automation systems at General Motors Corp., is manufacturing market development manager for Lotus Development Corp.



```
A4: [W16] '  1. Log In

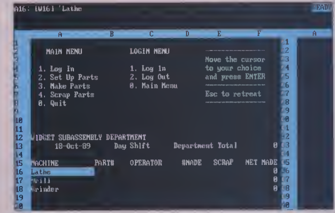
      A            B          C          D       E          F
   MAIN MENU

 1. Log In
 2. Set Up Parts
 3. Make Parts
 4. Scrap Parts
 0. Quit


IDGET SUBASSEMBLY DEPARTMENT
     18-Oct-89       Day Shift       Department Total         0

ACHINE          PART#     OPERATOR     #MADE   SCRAP   NET MADE
athe                                                          0
rill                                                          0
rinder                                                        0
```

1 Retrieve the template, which automatically sets up the vertical menus (one of which it hides), the production-data chart, and the vertical window at the right. Use the UpArrow and DownArrow keys to move the cell pointer on the Main Menu. Note that the cell pointer wraps around in either direction. This is true for any menu in the program. Select Log In: Press 1 or move the cell pointer to that option and press Return.



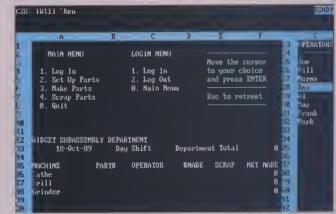
```
A16: [W16] 'Lathe

      A            B          C          D       E          F
   MAIN MENU              LOGIN MENU          ----------------
                                              Move the cursor
 1. Log In                1. Log In           to your choice
 2. Set Up Parts          2. Log Out          and press ENTER
 3. Make Parts            0. Main Menu        ----------------
 4. Scrap Parts                               Esc to retreat
 0. Quit                                      ----------------


IDGET SUBASSEMBLY DEPARTMENT
     18-Oct-89       Day Shift       Department Total         0

ACHINE          PART#     OPERATOR     #MADE   SCRAP   NET MADE
Lathe                                                         0
rill                                                          0
rinder                                                        0
```

2 The Log-In Menu appears with the cell pointer on the first option. Press Return or press 1. (You can return to the Main Menu by pressing Escape or selecting Main Menu.) A help message appears, and the cell pointer is placed in the *MACHINE* column of the production-data chart. With the cell pointer on *Lathe* (see screen), press Return.

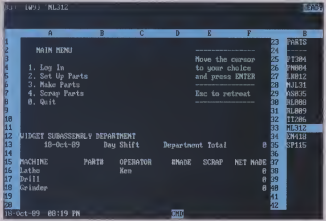


```
C28: [W11] 'Ken                                                     READY

      A            B          C          D       E          F           C
   MAIN MENU              LOGIN MENU          ----------------     PERATORS
                                              Move the cursor
 1. Log In                1. Log In           to your choice       oe
 2. Set Up Parts          2. Log Out          and press ENTER      ill
 3. Make Parts            0. Main Menu        ----------------     orma
 4. Scrap Parts                               Esc to retreat       Ken
 0. Quit                                      ----------------     l
                                                                   ue
                                                                   rank
                                                                   ark
IDGET SUBASSEMBLY DEPARTMENT
     18-Oct-89       Day Shift       Department Total         0

ACHINE          PART#     OPERATOR     #MADE   SCRAP   NET MADE
athe                                                          0
rill                                                          0
rinder                                                        0
```

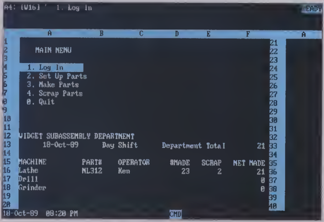
3 A list of machine operators appears in the window. Move the cell pointer to *Ken* (see screen) and press Return. Ken's name is placed in the *OPERATOR* column of the production chart, opposite *Lathe*. The help message and list of operators disappear, and the cell pointer returns to the Log-In Menu. Select Main Menu or press Escape to return to the Main Menu.



```
B3: [W9] 'ML312                                                      EADY

      A              B        C        D        E        F
                                                              23 PARTS
   MAIN MENU                                   ------------   24 -----
                                               Move the cursor 25 PT304
 1. Log In                                     to your choice  26 PN004
 2. Set Up Parts                               and press ENTER 27 LK012
 3. Make Parts                                 ------------   28 NJL31
 4. Scrap Parts                                Esc to retreat 29 AS035
 0. Quit                                       ------------   30 RL008
                                                              31 RL009
                                                              32 TT206
                                                              33 ML312
WIDGET SUBASSEMBLY DEPARTMENT                                 34 EN418
      18-Oct-89      Day Shift      Department Total       0  35 SP115
                                                              36
MACHINE          PART#     OPERATOR     #MADE   SCRAP  NET MADE 37
Lathe                      Ken                               0  38
Drill                                                        0  39
Grinder                                                      0  40
                                                              41
                                                              42
18-Oct-89  08:19 PM                    CMD
```

4 Select Set Up Parts. Again, the cell pointer is placed on *Lathe* in the *MACHINE* column of the production chart, and a help message appears. Select *Lathe* by pressing Return. A parts list appears in the window. Move the cell pointer to part *ML312* (see screen) and press Return. Part number ML312 is placed in the *PART#* column of the chart, the help message and list of parts disappear, and the cell pointer returns to the Main Menu.



```
A4: [W16] '  1. Log In                                               EADY

      A              B        C        D        E        F           A

   MAIN MENU

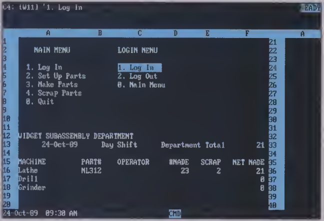
 1. Log In
 2. Set Up Parts
 3. Make Parts
 4. Scrap Parts
 0. Quit


WIDGET SUBASSEMBLY DEPARTMENT
      18-Oct-89      Day Shift      Department Total      21

MACHINE          PART#     OPERATOR     #MADE   SCRAP  NET MADE
Lathe            ML312     Ken             23       2       21
Drill                                                        0
Grinder                                                      0


18-Oct-89  08:20 PM                    CMD
```

5 Select Make Parts. The cell pointer moves to the *#MADE* column of the chart. Ken can now enter a number. Type 23 and press Return. The cell pointer returns to the Main Menu. You can use this procedure to select Scrap Parts and enter a number, say 2, in the *SCRAP* column. The difference between the values in the two columns appears in the *NET MADE* column.



```
C4: [W11] '1. Log In                                                 EADY

      A              B        C        D        E        F           A

   MAIN MENU             LOGIN MENU

 1. Log In               1. Log In
 2. Set Up Parts         2. Log Out
 3. Make Parts           0. Main Menu
 4. Scrap Parts
 0. Quit


WIDGET SUBASSEMBLY DEPARTMENT
      24-Oct-89      Day Shift      Department Total      21

MACHINE          PART#     OPERATOR     #MADE   SCRAP  NET MADE
Lathe            ML312                     23       2       21
Drill                                                        0
Grinder                                                      0


24-Oct-89  09:30 AM                    CMD
```

6 To log Ken out, select Log In on the Main Menu. When the Log-In Menu appears, select Log Out. The cursor jumps to the first cell of the data chart, and a help message appears. With the cursor on *Lathe*, press Return. Ken's name is erased from the chart and the cursor returns to the Log-In Menu (see screen). To quit, press Escape or 0 to return to the Main Menu. Then select Quit, and enter Y to confirm.

ural vehicle for creating the link—with machines as rows and production counts as columns. Typically, the production schedulers and manufacturing engineers in the front office are already using *1-2-3* to analyze production data. But also typically, they are rekeying data from a variety of paper forms or, if they're lucky, importing an ASCII data file that was created by a mainframe batch program the day before.

It is an obvious step to capture the data in a spreadsheet to start with. The trick is to make that step unintimidating to an operator, which is the point of this template. The next obvious step is to link the operators and the office in a local area network so that the data won't have to be handled twice. We'll deal with that in a later article.

AN OPERATOR'S TEMPLATE

Clearly, it doesn't make sense to train all of your machine operators to use *1-2-3*. Just a PC keyboard itself could be daunting. But I have found that you can quickly overcome keyboard phobia—and apprehension about computers in general—by using a template that minimizes keystrokes and visual confusion. What I will describe is a macro-based "point-and-shoot" template that can be used in many manufacturing applications, and in many nonmanufacturing applications as well.

The template uses a vertical menu system that is analogous to a system of pull-down menus. A user moves the cell pointer vertically over the options with the UpArrow and DownArrow keys and selects an option by pressing Return. When a second menu pops up, the cell pointer jumps to it, but the first menu stays on the screen. The data-entry form is always visible. And a message tells the user he can use the Escape key to retreat to the previous step.

In the application described here, an operator logs in by selecting a machine from a list of machines, by selecting his own name from a list of operators, and by selecting the part to be processed from a list of parts. When that sequence is complete, the operator enters the total number of parts produced and the number of those parts that must be scrapped because of defects. The template calculates net production.

The operator may then log off that machine and onto another, or log off entirely. The template retains the production data and accepts new data from other operators on the list. It also maintains a running count of the total net-parts production. When an operator or supervisor selects Quit, the production data is stored on disk under a name consisting of the current date.

A PRACTICAL DESIGN

This design reflects a lot of field experience. By restricting the number of functional keys to just the digits and the UpArrow, DownArrow, Return, and Escape keys, we pretty much eliminate keyboard phobia. As for the handling of menus, I have found that an operator doesn't like to see the screen jumping around from one part of a spreadsheet to another. And he does like to see where he came from and how he can retreat.

The template also features a vertical selection window. This allows the user—in this particular application—to specify an operator name or a part number by using the point-and-shoot method. A macro then enters that item into the correct cell. That avoids the need to retype information, obviates any need to learn the keyboard, and minimizes errors.

Finally, the operator is always under macro control. The template monitors all keystrokes, using a {GET} command and {IF} commands to validate each keystroke. The operator won't stumble into a menu or other area of the spreadsheet that isn't part of the application.

The template has been built with modular macro subroutines. Some of these incorporate advanced techniques, including dynamic code, which is code that changes even as the macro is running. If you study these modules, you'll see that you can easily expand the template to include additional hierarchical vertical menus, data-collection "sheets," and lists of data that the operator selects by pointing and shooting.

To build the template, follow the instructions in the setup box to the right. Don't be concerned when two of the string formulas in the macro evaluate to ERR. They will assume values when the macro runs. Then, to demonstrate the template, perform the six steps described in the series of screens on pages 39 and 40. Hold down the Control key and press Break to exit the macro when you're debugging the template.

MODIFICATIONS

We tried to avoid mind-numbing complexity in the macro. The result is that this template may not be ready for your

HOW TO SET UP THE OPERATOR WORKSHEET

1. Releases
This model runs in *1-2-3* Releases 2.01, 2.2, and 3.

2. Individual column widths

Column	Width
A	16
C	11
D	8
E	8
F	11

For example, to set the width of column A, place the cell pointer in column A, select /Worksheet Column Set-Width, enter 16.

3. Cell formats

Format	Range
Date 1	A13
Fixed 0	D16..F18

For example, to set the format for cell A13, select /Range Format Date 1 and indicate cell A13.

4. Cell protection
Select /Range Unprotect (/Range Unprot in Releases 2.2 and 3) and specify range E2..E11. This will provide a distinctive screen color for help messages.

5. Labels
Enter in range A2..F18 all the labels shown in figure 1. Do not enter the values shown in red; these are the results of formulas. Be sure to precede each label in ranges A4..A8 and C4..C6 with an apostrophe label prefix. Right-align the labels in range D15..F15. For the best appearance, precede the strings located in the following ranges with the number of spaces indicated below:

Range	Spaces
A2	4
A4..A8	2
B13	5

To create the dashed lines, enter an apostrophe and 15 hyphens in cell E2. Copy cell E2 to cells E6, E8, and E11.

Note that when you activate the macro, it will hide the menu in range C2..C6 and the messages in range E2..E11 until they are needed.

Enter in range B21..C35 all the labels shown in figure 2.

Enter in range A46..B172 all the labels shown in figure 3 except those shown in red. Precede the labels that are shown indented in column A with a quotation mark (") and no spaces. The indents are intended to help you follow the macro's logic. Note that the labels in lines 88 and 90 are broken because of their length. In each case be sure to enter both parts on one line with no space between the two parts.

6. Range names

Name	Range
blank_col	A21
date	A13
file_data	A12..F18
login_opts	C4..C6
login_rng	C2..C6
made	D16..D18
main_opts	A4..A8
main_rng	A2..A8
msg1_rng	E2..E8
msg2_rng	E6..E11
oper_list	C25..C32
oper_rng	C23..C32
part_list	B25..B35
part_rng	B23..B35
prod_rng	A16..F18
scrap	E16..E18
vert_loc	G1

Use the Range Name Create command to assign the range names above. To assign the range name *blank_col*, for example, select /Range Name Create, enter *blank_col*, and indicate cell A21.

To assign the range names in figure 3, select /Range Name Labels Right, indicate range A46..A161, and press Return. Then select /Range Name Labels Right, indicate range A166..A172, and press Return.

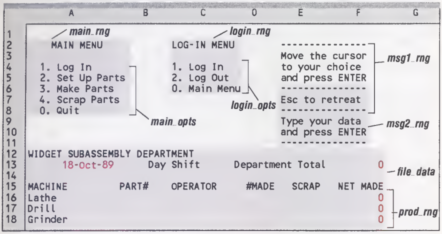
7. Enter and copy formulas

Cell	Formula
A13	@NDW
F13	@SUM(F16..F18)
F16	+D16−E16

Copy cell F16 to range F17..F18.

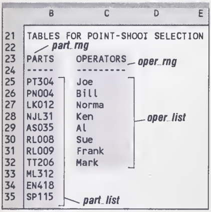
B70	+"/RFR"&screen&"~{GDTD}"&screen&"~{GOTO}"&ctrl_range&"~"
B82	+"{IF @VALUE(key)>=@RDWS("&ctrl_range&")}{BRANCH menu_loop}"
B156	+"/FXF"&@STRING(@MDNTH(date),0)&"-"&@STRING(@DAY(date),0)&"-"&@STRING(@YEAR(date),0)&"~file_data~R{ESC}"

8. Save
Save the blank template. Select /File Save and enter *template* or another file name that's not currently in your default directory.



```
        A              B             C         D         E              F           G
 1
 2    MAIN MENU                 LOG-IN MENU          ---------------
 3                                                   Move the cursor
 4   1. Log In                  1. Log In            to your choice
 5   2. Set Up Parts            2. Log Out           and press ENTER
 6   3. Make Parts              0. Main Menu         ---------------
 7   4. Scrap Parts                                  Esc to retreat
 8   0. Quit                                         ---------------
 9                                                   Type your data
10                                                   and press ENTER
11                                                   ---------------
12 WIDGET SUBASSEMBLY DEPARTMENT
13       18-Oct-89        Day Shift       Department Total          0
14
15 MACHINE          PART#     OPERATOR      #MADE    SCRAP    NET MADE
16 Lathe                                                             0
17 Drill                                                             0
18 Grinder                                                           0
```

FIGURE 1



```
      B          C            D         E
21 TABLES FOR POINT-SHOOT SELECTION
22
23 PARTS     OPERATORS
24 -----     ---------
25 PT304     Joe
26 PN004     Bill
27 LK012     Norma
28 NJL31     Ken
29 AS035     Al
30 RL008     Sue
31 RL009     Frank
32 TT206     Mark
33 ML312
34 EN418
35 SP115
```

FIGURE 2

real-world application. For the real world, you would probably want to change or add some features.

For example, when you select Quit in this template, a File Xtract command automatically stores the production data on disk in a file whose name is the current date. The *1-2-3* session ends, and you are returned to DOS. That's fine if you want to collect an entire day's data in one file, but not if you want to capture data by shift. To capture shift data, you could add a Main Menu option called Store Shift Data, use a {GET} command to capture the shift number, and include the shift number in the file name under which the data is stored.

Such a macro might be designed also to log out shift operators automatically. Or you might decide you need more protection against loss of data. You could cause the production record to be saved on disk every time a new number was entered. You could also restrict an operator to entering data only in the row in the data chart on which his name was entered by the log-in procedure. You might also want to give the operator the option of processing a different part on the same machine.

As it stands, this template records only department totals for each machine's output and scrap parts. Depending on a plant's production philosophy, it might be desirable to provide a separate worksheet for each machine or for each operator.

Though designed for *1-2-3* Release 2.01, the template will run in Release 2.2 and Release 3. With the new releases, you could improve screen appearance by adding the {FRAMEOFF} command to the *sheet_setup* module of the macro. If you use Release 3, you probably would want to put the macros, the parts and operators lists, and maybe the menus on different worksheets.

If you're a veteran *Symphony* user, you can certainly adapt this model to *Symphony*. You would want to make all of the individual menus—and the production chart, operator table, and parts table—into windows. The ranges in which cursor movement occurs would stay the same.

Here are a few—by no means all—of the things you'd have to do: Instead of using the command {GOTO}xxxx_rng~, you'd use {SERVICES}WUxxxx_rng~. Eliminate WWV and WWC commands. Preset the horizontal borders in the windows and remove the WTH and WTC commands. Change {ESC} to {ESCAPE}. In menu commands, replace the slash with {MENU} or {SERVICES}.

If you study the code along with the functional description that follows, you will see the need for other changes as well. Detailing them all is beyond the scope of this article.

HOW THE MACRO

A key feature of the program is the table of variables in range A166..B172. The macros assign these variables different values at different times. This simplifies the remaining code, which can use the variables' range names instead of a much longer list of range names.

The economy is particularly evident with the *ctrl_range* variable. This variable holds the name of the range to which cell pointer movement will be restricted. The seven possible ranges are the Main Menu options, the Log-In Menu options, the production-data table, the parts-count column, the scrap-count column, the list of operators, and the list of part numbers.

Note also that the range that the active menu occupies is stored in the *screen* variable. Using this variable, along with *ctrl_range*, you could add many more menus with minimal increase in code.

We've attempted to provide macro modules that you can use in a number of other applications, and to make as clear as possible the logic flow. That is why the code for this particular application isn't as condensed as it might be.

STARTUP

When the template is loaded, it starts the *sheet_setup* routine.

Sheet_setup uses the *scrnoff* subroutine to freeze the window and control panel, moves the cell pointer to cell G1, and sets up the vertical window that will contain the operator and part lists. It hides the Log-In Menu and the user-prompt messages and puts the cell pointer on the first item of the Main Menu.

Main_menu inserts the range name for the Main Menu (*main_rng*) in the cell named *screen* and inserts the range name for Main Menu options (*main_opts*) in the cell named *ctrl_range*. It then calls the *menu_control* routine.

MENU CONTROL

Menu_control freezes the window and panel and recalculates the range named *menu_dest*, which is the next macro command. This resets the format of the range currently in *screen*, moves the cell pointer to the proper range, and unfreezes the screen.

Menu_loop is a general subroutine that responds to the content of the cell

MODULES WORK

named *key* (cell B169) and can be used for each vertical menu that's part of the system. A {GET} command captures the operator's keystroke and stores it in *key*. If the keystroke is an UpArrow or DownArrow, control is passed to the *arrow_control* routine. If the operator presses Return, control passes to the *menu_sel* routine. If the operator presses the number of one of the options instead of pressing Return, the *menu_no* routine validates the number, puts it in the variable named *menu_opt*, and returns control to the third line of *main_menu*. Pressing Escape removes any number currently in *menu_opt* and returns control to *main_menu*.

Arrow_control is called from *menu_loop* if the operator presses UpArrow or DownArrow. In either case, @functions check the position of the cell pointer within the range of menu options and, if indicated, "wrap" the cell pointer around to the beginning or end of the option list. Otherwise, the cell pointer moves up or down one row as commanded. Control then returns to *menu_loop*.

Menu_sel is called from *menu_loop* if the user presses Return. It uses a string function to extract the number associated with the highlighted option, puts the number in *menu_opt*, and returns control to the third line of *main_menu*.

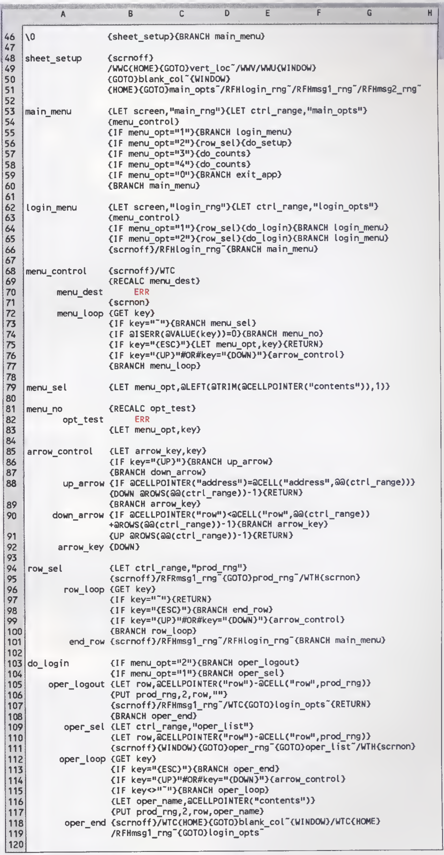
Main_menu (continued) causes control to branch to other routines, depending on the content of *menu_opt*. The routines are *login_menu*, *row_sel* and *do_setup*, *do_counts*, and *exit_app*.

MENU OPTIONS: LOG IN

Login_menu sets the Log-In Menu range (*login_rng*) as the contents of *screen*, sets the log-in option range (*login_opts*) as the contents of *crtl_range* (cell B167), and calls the *menu_control* routine. If that routine returns 1 or 2 as the contents of *menu_opt*, control passes to *row_sel*. Otherwise, range *login_rng* is rehidden and control returns to *main_menu*.

Row_sel sets the production-data range (*prod_rng*) as the contents of *ctrl_range*, unhides the cursor/Escape help message, and then moves the cell pointer to the production-data chart.

Row_loop allows the operator to position the cell pointer on the appropriate



```
                A                B        C       D       E         F         G         H
 46 \0                {sheet_setup}{BRANCH main_menu}
 47
 48 sheet_setup       {scrnoff}
 49                   /WWC{HOME}{GOTO}vert_loc~/WWV/WWU{WINDOW}
 50                   {GOTO}blank_col~{WINDOW}
 51                   {HOME}{GOTO}main_opts~/RFHlogin_rng~/RFHmsg1_rng~/RFHmsg2_rng~
 52
 53 main_menu         {LET screen,"main_rng"}{LET ctrl_range,"main_opts"}
 54                   {menu_control}
 55                   {IF menu_opt="1"}{BRANCH login_menu}
 56                   {IF menu_opt="2"}{row_sel}{do_setup}
 57                   {IF menu_opt="3"}{do_counts}
 58                   {IF menu_opt="4"}{do_counts}
 59                   {IF menu_opt="0"}{BRANCH exit_app}
 60                   {BRANCH main_menu}
 61
 62 login_menu        {LET screen,"login_rng"}{LET ctrl_range,"login_opts"}
 63                   {menu_control}
 64                   {IF menu_opt="1"}{row_sel}{do_login}{BRANCH login_menu}
 65                   {IF menu_opt="2"}{row_sel}{do_login}{BRANCH login_menu}
 66                   {scrnoff}/RFHlogin_rng~{BRANCH main_menu}
 67
 68 menu_control      {scrnoff}/WTC
 69                   {RECALC menu_dest}
 70       menu_dest        ERR
 71                   {scrnon}
 72       menu_loop   {GET key}
 73                   {IF key="~"}{BRANCH menu_sel}
 74                   {IF @ISERR(@VALUE(key))=0}{BRANCH menu_no}
 75                   {IF key="{ESC}"}{LET menu_opt,key}{RETURN}
 76                   {IF key="{UP}"#OR#key="{DOWN}"}{arrow_control}
 77                   {BRANCH menu_loop}
 78
 79 menu_sel          {LET menu_opt,@LEFT(@TRIM(@CELLPOINTER("contents")),1)}
 80
 81 menu_no           {RECALC opt_test}
 82         opt_test       ERR
 83                   {LET menu_opt,key}
 84
 85 arrow_control     {LET arrow_key,key}
 86                   {IF key="{UP}"}{BRANCH up_arrow}
 87                   {BRANCH down_arrow}
 88         up_arrow  {IF @CELLPOINTER("address")=@CELL("address",@@(ctrl_range))}
                      {DOWN @ROWS(@@(ctrl_range))-1}{RETURN}
 89                   {BRANCH arrow_key}
 90       down_arrow  {IF @CELLPOINTER("row")<@CELL("row",@@(ctrl_range))
                      +@ROWS(@@(ctrl_range))-1}{BRANCH arrow_key}
 91                   {UP @ROWS(@@(ctrl_range))-1}{RETURN}
 92        arrow_key  {DOWN}
 93
 94 row_sel           {LET ctrl_range,"prod_rng"}
 95                   {scrnoff}/RFRmsg1_rng~{GOTO}prod_rng~/WTH{scrnon}
 96         row_loop  {GET key}
 97                   {IF key="~"}{RETURN}
 98                   {IF key="{ESC}"}{BRANCH end_row}
 99                   {IF key="{UP}"#OR#key="{DOWN}"}{arrow_control}
100                   {BRANCH row_loop}
101          end_row  {scrnoff}/RFHmsg1_rng~/RFHlogin_rng~{BRANCH main_menu}
102
103 do_login          {IF menu_opt="2"}{BRANCH oper_logout}
104                   {IF menu_opt="1"}{BRANCH oper_sel}
105      oper_logout  {LET row,@CELLPOINTER("row")-@CELL("row",prod_rng)}
106                   {PUT prod_rng,2,row,""}
107                   {scrnoff}/RFHmsg1_rng~/WTC{GOTO}login_opts~{RETURN}
108                   {BRANCH oper_end}
109         oper_sel  {LET ctrl_range,"oper_list"}
110                   {LET row,@CELLPOINTER("row")-@CELL("row",prod_rng)}
111                   {scrnoff}{WINDOW}{GOTO}oper_rng~{GOTO}oper_list~/WTH{scrnon}
112        oper_loop  {GET key}
113                   {IF key="{ESC}"}{BRANCH oper_end}
114                   {IF key="{UP}"#OR#key="{DOWN}"}{arrow_control}
115                   {IF key<>"~"}{BRANCH oper_loop}
116                   {LET oper_name,@CELLPOINTER("contents")}
117                   {PUT prod_rng,2,row,oper_name}
118         oper_end  {scrnoff}/WTC{HOME}{GOTO}blank_col~{WINDOW}/WTC{HOME}
119                   /RFHmsg1_rng~{GOTO}login_opts~
120
```

FIGURE 3. Note that the labels in rows 88 and 90 are broken because of their length. The figure is continued on the next page.

]

row of the production-data chart. It uses *arrow_control* and works much like *menu_loop*. If Return is pressed, control returns to the third or fourth line of *login_menu*, which passes control to *do_login*. If Escape is pressed, *end_row* rehides the Log-In Menu and help message and returns control to *main_menu*.

Do_login is called if *row_sel* returns control to *login_menu*. If *menu_opt* contains a 1, it branches to *oper_sel*. But if *menu_opt* contains 2, it branches to *oper_logout*.

Oper_sel makes range *oper_list* the menu-control variable (*ctrl_range*), stores the relative row position of the cell pointer in variable *row*, and freezes the screen. It activates the window at the right, positions the list of operators (*oper_rng*) in this window, moves the cell pointer to the first entry in the list, and then passes control to *oper_loop*.

Oper_loop uses *arrow_control* and works much like *menu_loop*. If the operator presses Return, it puts the contents of the cell indicated by the cell pointer into *oper_name* (cell B171), and puts the string in *oper_name* into the appropriate cell in the production chart (range *prod_rng*). It then passes control to *oper_end*.

Oper_end rehides the message and returns control to *login_menu*.

Oper_logout stores the relative row of the cell pointer in *row*, erases the operator name, rehides the cursor/Escape message, and passes control to *oper_end*.

MENU OPTIONS: SETUP

Do_setup is called from *main_menu* (following a *row_sel* routine). It sets the range named *part_list* as the content of *ctrl_range*, activates the window at the right, positions the list of part numbers (*part_rng*) in this window, moves the cell pointer to the first entry in the list, and then passes control to *setup_loop*.

Setup_loop allows the operator to select a part number. It works much like *oper_loop*. If the operator presses Return, it puts the content of the cell indicated by the cell pointer into *part_name* (cell B172) and then puts the string in *part_name* into the appropriate cell in the production chart. It then passes control to *setup_end*.

Setup_end rehides the cursor/Escape message, moves the cell pointer to the Main Menu, and then returns control to *main_menu*.

MENU OPTIONS: PART COUNTS

Do_counts is called from *main_menu*. If *menu_opt* contains 3, it branches to *do_made*. If *menu_opt* contains 4, it branches to *do_scrap*.

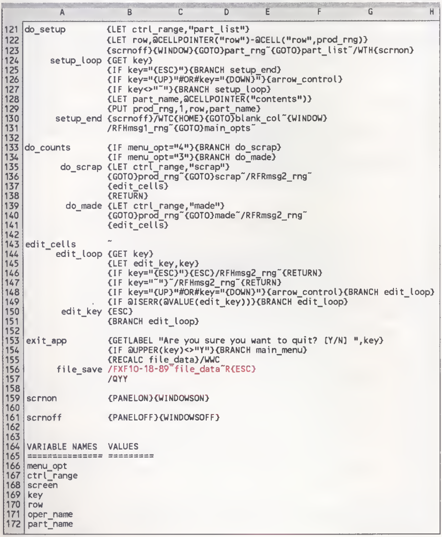
Do_made sets the range named *made* (D16..D18) as the content of *ctrl_range*, positions the cell pointer there, unhides the data-entry message, and calls routine *edit_cells*.

Do_scrap sets the range named *scrap* (E16..E18) as the content of *ctrl_range*, positions the cell pointer, unhides the data-entry message, and calls *edit_cells*.

Edit_cells polices data entry, accepting only numerals, UpArrow, DownArrow, Return, and Escape as keystrokes. Pressing Escape returns control to *do_made* or *do_scrap* and then it returns control to *main_menu*.

MENU OPTIONS: QUIT

Exit_app is called from *main_menu* and processes a Quit choice. It uses a {GETLABEL} command to confirm the choice. If *Y* or *y* is entered, a File Xtract procedure saves the production data under a file name consisting of the current date before the Quit command is processed. ■



```
            A                B          C         D         E         F          G          H
121 do_setup        {LET ctrl_range,"part_list"}
122                 {LET row,@CELLPOINTER("row")-@CELL("row",prod_rng)}
123                 {scrnoff}{WINDOW}{GOTO}part_rng~{GOTO}part_list~/WTH{scrnon}
124      setup_loop {GET key}
125                 {IF key="{ESC}"}{BRANCH setup_end}
126                 {IF key="{UP}"#OR#key="{DOWN}"}{arrow_control}
127                 {IF key<>"~"}{BRANCH setup_loop}
128                 {LET part_name,@CELLPOINTER("contents")}
129                 {PUT prod_rng,1,row,part_name}
130       setup_end {scrnoff}/WTC{HOME}{GOTO}blank_col~{WINDOW}
131                 /RFHmsg1_rng~{GOTO}main_opts~
132
133 do_counts       {IF menu_opt="4"}{BRANCH do_scrap}
134                 {IF menu_opt="3"}{BRANCH do_made}
135        do_scrap {LET ctrl_range,"scrap"}
136                 {GOTO}prod_rng~{GOTO}scrap~/RFRmsg2_rng~
137                 {edit_cells}
138                 {RETURN}
139         do_made {LET ctrl_range,"made"}
140                 {GOTO}prod_rng~{GOTO}made~/RFRmsg2_rng~
141                 {edit_cells}
142
143 edit_cells      ~
144       edit_loop {GET key}
145                 {LET edit_key,key}
146                 {IF key="{ESC}"}{ESC}/RFHmsg2_rng~{RETURN}
147                 {IF key="~"}~/RFHmsg2_rng~{RETURN}
148                 {IF key="{UP}"#OR#key="{DOWN}"}{arrow_control}{BRANCH edit_loop}
149                 {IF @ISERR(@VALUE(edit_key))}{BRANCH edit_loop}
150        edit_key {ESC}
151                 {BRANCH edit_loop}
152
153 exit_app        {GETLABEL "Are you sure you want to quit? [Y/N] ",key}
154                 {IF @UPPER(key)<>"Y"}{BRANCH main_menu}
155                 {RECALC file_data}/WWC
156       file_save /FXF10-18-89~file_data~R{ESC}
157                 /QYY
158
159 scrnon          {PANELON}{WINDOWSON}
160
161 scrnoff         {PANELOFF}{WINDOWSOFF}
162
163
164 VARIABLE NAMES  VALUES
165 =============== =========
166 menu_opt
167 ctrl_range
168 screen
169 key
170 row
171 oper_name
172 part_name
```

FIGURE 3 continued

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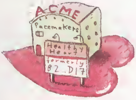
Range Names are Easier to Remember

Why call a worksheet range A10..B12 when you can call it *costs*?



BY DANIEL GASTEIGER

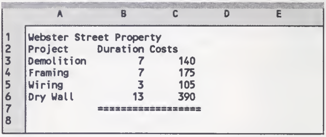
Understanding the structure of a worksheet can become intuitive. Columns and rows intersect to provide addresses where you can store labels, values, and formulas. As you learn about the functions and commands available to manipulate this well-ordered environment, you can take this orderliness for granted.

However, those simple column letters and row numbers quickly become confusing when you build even a small worksheet model. Try to describe the worksheet's layout, and almost immediately you're using phrases like "the *costs* column" and "the *rate* cell" rather than "range B1..B50" and "cell C2."

If such names simplify your explanation of a worksheet, why not use names to simplify your work in the worksheet? *1-2-3* and *Symphony* let you do just that. You can assign names to areas of your worksheet so that formulas and menu commands understand when you refer to "the *costs* column" and "the *rate* cell."

ASSIGN A NAME

Any worksheet range, whether multi- or single-celled, can have a name. Consider the simple worksheet shown in the following figure:



```
          A           B        C        D        E
1  Webster Street Property
2  Project     Duration Costs
3  Demolition        7      140
4  Framing           7      175
5  Wiring            3      105
6  Dry Wall         13      390
7               =================
8
```

The worksheet lists various tasks involved in a small construction project. Column A lists the tasks, column B lists the number of hours each task takes, and column C lists the total cost of each task. The next step in building this worksheet might be to enter summary formulas in cells B8 and C8. To do that, you could move the pointer to cell B8 and enter @SUM(B3..B6). Then you could use the Copy command to copy this formula to cell C8. Granted, these steps aren't challenging or time-consuming, but for contrast, try using range names to do the same task.

To follow this discussion, you need *1-2-3* Release 2.01 or 2.2 or *Symphony*. Start in a blank worksheet. With the pointer in column A, select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) and specify 12. Enter the labels and values as shown in the figure. Assign the name *hours* to range B3..B6: Move the pointer to cell B3, select /Range Name Create (in *Symphony*, MENU Range Name Create), enter *hours*, and indicate range B3..B6.

Nothing visibly changes in the worksheet. However, from now on you can refer to range B3..B6 as *hours*. To see a range name in action, move the cell pointer to cell B8 and enter the formula @SUM(hours). The sum of the values in column B appears in cell B8.

Use the Copy command to copy this formula to cell C8. You might think that the copied formula will refer to the range named *hours*, but it doesn't. To see this for yourself, move the pointer to cell C8 and examine the formula. The copy refers to range C3..C6. The point here is that a named range reference is, by default, relative.

1-2-3 and *Symphony* remember and display range names for your benefit only. Any commands you issue act on the underlying range address. If you wish to create a formula that always refers to the range named *hours*, make the reference absolute by preceding it with a dollar sign. For example, move the cell pointer to cell D3 and

---

Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to LOTUS.*

enter the formula +B3/@SUM($hours). Copy this formula to range D4..D6 and notice that the range name *hours* appears in each copy.

To confirm that the range name exists only for your benefit, edit one of the formulas you just created. Move the pointer to cell D6 and press the EDIT key (F2 on most computers). The formula on the edit line of the control panel displays the range address B3..B6 rather than the range name. Press Return to escape from Edit mode. The section of this article entitled "Edit Range Names in Formulas" explores this phenomenon in greater depth.

PUT THE NAME TO WORK

With very little effort you're already putting range names to work. Assigning a range name requires extra effort up front, but your worksheet becomes easier to decipher. You can write the formula @SUM(hours) anywhere on the worksheet, and it will always mean the sum of the hours. By contrast, the formula @SUM(B3..B6) offers no clue as to the values it sums.

Range names are not just for use in formulas. Any command sequence that requires you to identify a cell or range address accepts a range name in place of a cell reference. For example, use a range name as a shortcut to copy the values from range B3..B6 to range B11..B14. Move the cell pointer to cell B11. Then press slash (in *Symphony*, MENU), select Copy, and enter the name *hours* as the range to copy from. Press Return to identify cell B11 as the range to copy to. The values in the *hours* range automatically appear.

Here's another quick exercise. Let's say you want to view the contents of the *Duration* column. Press the GOTO key (F5 on most computers), and enter *hours*. No matter where the cell pointer was, it jumps directly to the top-left corner of the range—in this case, cell B3.

Occasionally, you may want to examine the contents of a range without moving the cell pointer. This isn't a problem once you've assigned a name to the range. For example, move the cell pointer to cell G3. Imagine that you're entering information in this part of the worksheet and

JESSIE HARTLAND

need to review the contents of the *hours* range.

Select /Range Name Create (in *Symphony*, MENU Range Name Create) as if you plan to assign a new range name. A prompt instructing you to enter a range name appears on the control panel and a list of named ranges appears underneath it. Either type *hours* and press Return or highlight HOURS and press Return. *Hours* and its correct range address, B3..B6, appear in the control panel. Range B3..B6 is highlighted in the worksheet. When you're through perusing the data, press Escape several times until the program returns to Ready mode (in *Symphony*, SHEET mode).

> ***Assigning a range name requires some extra effort up front, but doing so makes your worksheet easier to decipher.***

SOME RANGE RULES

Learning all these uses for range names without understanding the rules that govern their use could lead you astray. It's important to know, for example, that *1-2-3* and *Symphony* use two specific corner cells to identify a range. For a multiple-cell range, they use the top-left corner cell and the lower-right corner cell. For a single-cell range, the program repeats the cell address twice—for example, A10..A10.

There are two ways to corrupt a named range. Moving data onto one of these corner cells is one method. You can move cells onto any other area within the range and not invalidate the range name, but the two corner cells are sacrosanct. Deleting the worksheet row or column containing one of the key corners also destroys a range name. However, you can delete rows and columns between the corner cells of the range. When you do this, the range definition contracts or expands to match the changing dimensions of the data. You can insert rows wherever you want. In almost every case, when you invalidate a range name, *1-2-3* and *Symphony* remember the name but do not associate any cell addresses with it.

A second way to corrupt a named range is to inadvertently move one of the corner cells and by doing so alter the dimensions of the range. For example, if the range A1..C4 is named *test* and you move cell C4 to cell E4, the dimensions of *test* expand to become A1..E4.

Sometimes you'll want to eliminate a range name from a worksheet. To do that, select /Range Name Delete (in *Symphony*, MENU Range Name Delete). Then either enter the name or highlight it and press Return. The name vanishes, but any formulas that include references to the name remain intact, because they look at the underlying cell addresses, not the range names.

Range names attach themselves to preexisting range references in the worksheet environment. To see how this works, examine the reference in the formula in cell C8 of your practice worksheet. Currently, that formula reads @SUM(C3..C6). Since this formula calculates the sum of the *Costs* column, assign a range name that helps identify the formula's purpose.

Select /Range Name Create (in *Symphony*, MENU Range Name Create), and enter *costs*. Then indicate range C3..C6 as the range to name. Now reexamine the formula in cell C8. It reads @SUM(costs).

Newly assigned range names attach themselves to all appropriate formulas and to appropriate range references that reside in settings made via the menus. To see how this works, assign range A2..C6 as the database Input range (in *Symphony*, Database range). Don't worry, you won't need to do any database operations—just assign the range so that you can see a range name in action. In *1-2-3* select /Data Query Input and specify range A2..C6. Then select Quit. In *Symphony* select MENU Query Settings Basic Database and specify range A2..C6. Then select Quit three times.

The next thing to do is assign the name *jobs* to range A2..C6. Users of *1-2-3* Release 2.2 can examine these settings by selecting /Data Query (in *Symphony*, MENU Query Settings). You'll see that the Input (in *Symphony*, Database) range has become *jobs*. If you're using *1-2-3* Release 2.01, reassign the name *jobs*. Select /Range Name Create, highlight JOBS and press Return. Then press DownArrow and Return. This tells *1-2-3* to use the range name *jobs*, but expand its reference to include one more row. Now select /Data Query Input and notice that the Input range is one row deeper than you originally assigned. It coincides with the range definition that you just expanded. Now redefine *jobs* as range A2..C6.

A new range name sticks to all corresponding range references. This includes other range names. For example, if you assign a second range name to the range already named *jobs*, the two names are synonyms for the same range.

Use the Range Name Create command to assign the name *chores* to range A2..C6. *1-2-3* Release 2.01 users should skip to the next section. *1-2-3* Release 2.2 and *Symphony* users can try the following: Select /Data Query (in *Symphony*, MENU Query Settings) and notice that the name *chores* has replaced *jobs* as the name of the Database range. Both names are still valid. However, since your software can display only one name, it displays the one that comes first alphabetically.

PERMANENT CONNECTIVITY

Sticky range names seem harmless, but they can behave in insidious ways. For example, you've already assigned two names to range A2..C6. Suppose you want to extend one of those names to include the values in column D. Try the following procedure:

Issue the Range Name Create command and enter the name *chores*, or select the name by pointing to it in the menu and pressing Return. Your software prompts you to identify which range to name and highlights range A2..C6. Expand the highlight by pressing the RightArrow key once, then press Return to accept the new range definition.

Now select /Data Query Input (in *Symphony*, MENU Query Settings Basic Database). Notice that the Database range is now A2..D6. It expanded along with the range name. Here lies the problem. *Jobs* was the name of the original Database range, but when you reassigned the name *chores*, you reassigned the Database range. It's reasonable, then, to assume that you've also reassigned the name *jobs*.

Check this by exiting from the menus. Issue the Range Name Delete command and indicate *chores* as the name to delete. Then issue the Range Name Create command and indicate *jobs* as the name to create. *1-2-3* and *Symphony* highlight range A2..D6, proving that when you reassigned the name *chores*, you also reassigned the name *jobs*. When you want to reassign one of two range names that refer to the same area, first delete one of the names.

ADJUST FORMULA REFERENCES

The sticky nature of range names is a benefit as well as a pitfall. As you saw a moment ago, when you assign an existing range name to a new range, any associated range references adjust along with the name.

Suppose that you specify a single column of values as both a graph range and a Database range. If these ranges are not named, whenever you add data to the column, you must respecify both ranges so that they include the new data. However, if you assign a range name to the column, you can update the graph- and query-range definitions by respecifying only one range.

Equally as useful, you can easily alter formulas by assigning range names to the cells that are referenced by the formulas. For example, enter the formula +C8/B8 in cell F1. This formula calculates the cost per hour for the project.

To clarify the formula, assign the name *tothrs* to cell B8 and *totcost* to cell C8. Now move the pointer to cell F1 and you'll see that the formula reads +TOTCOST/TOTHRS. Then suppose you decide that the formula should refer to cells B8 and C9 rather than to cells B8 and C8; you'll want to change one of the two references. Rather than edit the formula, you can reassign the range name *totcost*. Issue the Range Name Create command, indicate *totcost* as the name to assign, then press DownArrow and Return. The value of the formula in cell F1 immediately changes to 0, reflecting the new reference of the range name *totcost*.

Any time you wish to reassign a cell or range reference in a formula, you can simply reassign the range name. The range name sticks to the reference in the formula so that when you reassign the name, the reference changes along with it.

WHAT HAVE YOU DONE?

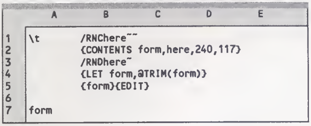
You've been using this practice worksheet for some time now, and several range names are attached to various

EDIT RANGE NAMES IN FORMULAS

Writing formulas that use range names instead of range addresses makes the formulas easy to understand at a glance. However, when it's time to edit a formula containing a named range, *1-2-3* Releases 2.01 and 2.2 and *Symphony* make things difficult for you because named ranges appear in the control panel as their cell addresses.

Test this yourself. Place the cell pointer on the @SUM formula in cell B8 of the model presented in the main text of this article. Then press the EDIT key (F2 on most computers). The formula adjacent to the current-cell indicator in the control panel reads @SUM(hours). However, the formula on the edit line reads @SUM(B3..B6). In a complex formula containing several named ranges, editing the range addresses is tedious. It's very difficult to draw a one-to-one correspondence between the cell addresses on the edit line and the range names that appear near the current-cell indicator.

The macro shown in the following figure puts the worksheet into Edit mode and preserves the formula's range names.



```
        A          B           C          D          E
1  \t         /RNChere~~
2             {CONTENTS form,here,240,117}
3             /RNDhere~
4             {LET form,@TRIM(form)}
5             {form}{EDIT}
6
7  form
```

To create the macro, start in a new worksheet, enter the labels as shown, and use the Range Name Labels Right command to assign the labels in column A as names for the adjacent cells of column B. If you use *Symphony*, replace the slashes in cells B1 and B3 with {MENU}. The main text of the article explains the Range Name Labels commands.

To use the macro, place the cell pointer in whatever cell you wish to edit. Hold down the MACRO key (Alt on most computers), and press T. Edit the cell as you normally would. Then press Return to return to the worksheet, or press Escape twice to leave the cell's contents unchanged.

ranges and cells. Sometimes remembering and keeping track of all the names you create can become daunting.

Fortunately you can easily check the status of your range names by invoking the Range Name Table command. To use the command, move the cell pointer to an unused area of the worksheet—in this case, cell H1. Then select /Range Name Table (in *Symphony*, MENU Range Name Table) and indicate cell H1 as the cell where the table should begin.

An easy way to check the status of your range names is to invoke the Range Name Table command.

The resulting table consists of two columns of labels. The column on the left lists alphabetically all the range names in the worksheet. The column on the right lists the addresses assigned to those range names. Any undefined range names appear in the left column but, depending on which product you're using, have ERR or no corresponding address in the right column. As you add and delete range names in a worksheet, you might find it useful to update the range-name table so that you can refresh your memory as to which names are in use.

Use caution when you issue the Range Name Table command. *1-2-3* and *Symphony* generate the table on command, regardless of whether there are enough available blank cells. The table erases any existing cell entries within the area needed.

SPEED COMMANDS

Simply having a list of names recorded in the sheet isn't always enough to help you remember what you've assigned. That's why *1-2-3* has a NAME key (F3 on most computers). *Symphony*'s corresponding function key is MENU (F10).

During any operation where you must specify a cell or range address, you can use the NAME key to simplify the procedure. To see how this works, move the cell pointer to cell C11. Then select /Copy (in *Symphony*, MENU Copy). Rather than type a cell or range name to copy from, press the NAME key (in *Symphony*, MENU). The control panel displays a menu of available range names. Press the NAME or MENU key a second time. A complete menu of named ranges appears in the display. In either case, select the range to copy from—in this case, *costs*—by moving the menu pointer to the name and pressing Return. Then press Return again to indicate cell C11 as the range to copy to.

QUICK SINGLES

It's very common, particularly for people who write macros, to assign a range name to a single cell. Often a cell contains an interest rate or other variable that applies to several calculations in a sheet. It's those types of cells that virtually beg for short and memorable range names.

In many cases you can clarify a worksheet by labeling named cells. This magazine regularly identifies each named cell in a worksheet by entering the cell's name as a label in an adjacent cell. For people who organize their worksheets like this, there's a shortcut to assigning the range names.

Let's say you already entered the cell labels. To illustrate the technique, use those in row 2 of the sample worksheet. Suppose you want to assign the range name *project* to cell A3, *duration* to cell B3, and *costs* to cell C3. Here's how to do it.

Select /Range Name Labels (in *Symphony*, MENU Range Name Labels). Notice that the menu options are Right, Down, Left, and Up. Any of these menu choices cause *1-2-3* or *Symphony* to assign each label in a specified range as a name for an adjacent cell. Select Down and indicate range A2..C2 as the label range. Each label in this range becomes the name for the cell directly below it. For example, cell B3 now has the name *duration*.

The Range Name Labels command behaves somewhat differently from the way the Range Name Create command behaves. When you use the Range Name Create command to reassign a range name, all references to the name remain attached and therefore will refer to the newly designated data. When you use a Range Name Labels command to reassign a name, you detach the name from all earlier references. Using the Range Name Labels command to reassign names is equivalent to deleting the names, then using the Range Name Create command to reassign them.

WHAT'S IN A NAME?

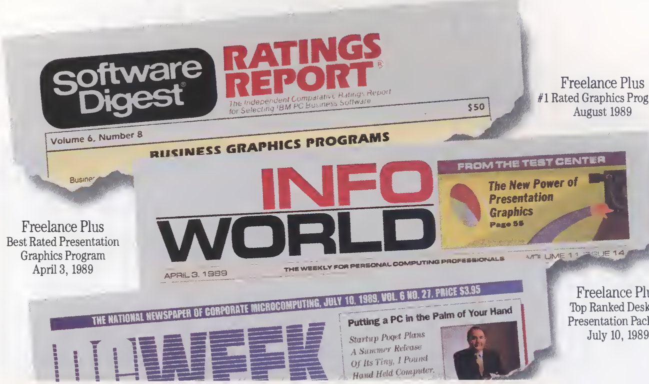
We've talked a lot about how range names work but haven't spent much time considering how to choose a good range name. There are three basic points to remember.

First, select a name that is mnemonic. If a name doesn't come to mind easily, or worse, doesn't suggest the cell or range's purpose, don't use it.

Second, keep names short. Long names use more memory than short ones. And a long name is often harder to work with since you're more apt to misspell it. In addition, *1-2-3* and *Symphony* use only the first 15 characters of a range name so that *companyaddress1* and *companyaddress2* appear as the same range name.

Third, generally use only alphabetic and underline characters in range names. Occasionally you may need to use numbers. If you use a number with letters, make sure that the combination doesn't make up a cell address. You could assign the name *ba10* to a range, but then does the formula BA10/5 refer to a cell named *ba10* or to the cell at the intersection of column BA and row 10? ■

When buying business graphics software, look out for number one.



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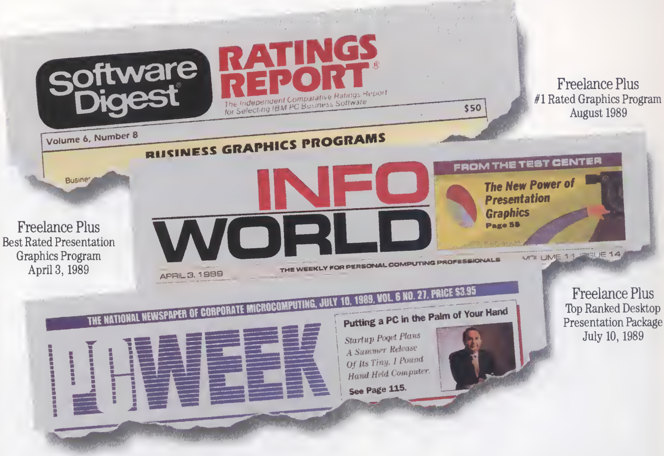

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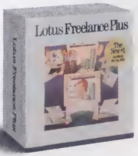

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The Normal Curve– A Simpler Way

Use a time-honored statistical method without looking through tables.

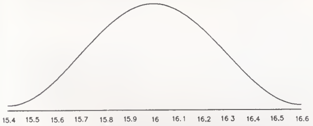
MARGARET KASAHARA

BY PHILIP PFAFF

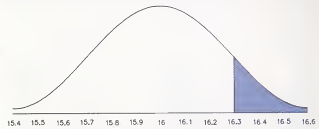
No company that produces a product can be completely consistent about quality. However, knowing the probability of producing an unacceptable product can often help you maximize performance. In some cases, where you can judge quality by a measurement, such as volume, you can use a statistical tool known as the normal distribution curve and any release of *1-2-3* or *Symphony* to determine probability.

Here's an example of a normal distribution: Meadowlark Beverages owns a bottling machine that can be set to dispense any amount of liquid. At any given setting, however, some bottles get too much, some too little, and some just the right amount of beverage. If the machine is set to dispense 16 fluidounces, most of the bottles it fills contain very close to 16 ounces. Some contain 15.9 or 16.1 ounces, a smaller number contain 15.8 or 16.2 ounces, and so on. The average, or mean, is 16 ounces.

The volume of beverage in the bottles is said to be normally distributed around the mean of 16 ounces. Put another way, the various amounts of liquid in a number of bottles tend to fall along the bell-shaped normal curve, as in the following figure.



Although it may not be worth the company's effort to calibrate the machine to the precision of a Swiss watch, some adjustments can be made. To determine if adjustments are necessary, Meadowlark's management decides to find the probability of the machine dispensing more than 16.3 ounces of liquid into a bottle. Statisticians express this probability in terms of the area under the curve to the right of a vertical line placed at 16.3 on the X axis.



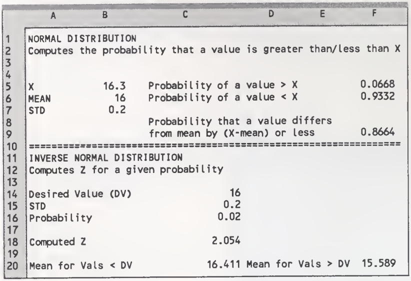
Note that the total area under the curve is considered to be one unit. That way the area can be divided into portions, or percentages, which can then be used to express probability.

Historically, one would find the area of a portion of the curve by consulting a printed table of normal-distribution values. The normal-distribution spreadsheet presented here computes a very close approximation of this value, saving you the bother of looking it up manually.

Create the worksheet now from the instructions in the setup box on page 59. When you're finished, read the following sections to learn how the model works.

USING THE MODEL

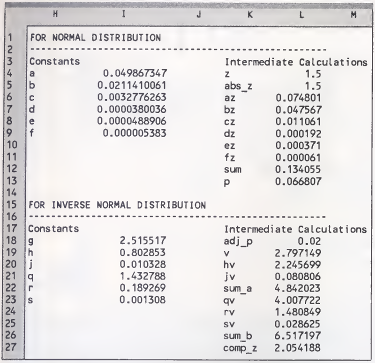
Figure 1 shows the work area of the normal-distribution worksheet. Figure 2, which we'll look at in detail later, shows the area where most of the computations take place. The values you entered in range B5..B7 of the



```
      A          B                C                    D        E         F

1   NORMAL DISTRIBUTION
2   Computes the probability that a value is greater than/less than X
3
4
5   X            16.3    Probability of a value > X               0.0668
6   MEAN           16    Probability of a value < X               0.9332
7   STD           0.2
8                        Probability that a value differs
9                        from mean by (X-mean) or less            0.8664
10  ==============================================================
11  INVERSE NORMAL DISTRIBUTION
12  Computes Z for a given probability
13
14  Desired Value (DV)                  16
15  STD                                0.2
16  Probability                       0.02
17
18  Computed Z                       2.054
19
20  Mean for Vals < DV              16.411 Mean for Vals > DV  15.589
```

FIGURE 1. This is the work area of the normal-distribution worksheet. You use the upper half to determine probabilities. Enter values for X and for a population's mean and standard deviation in range B5..B7. The formulas in range F5..F9 tell you the probabilities. Cell F5, for example, shows the probability that a randomly selected bottle from a population with a mean of 16 fluidounces and a standard deviation of 0.2 ounces will contain more than 16.3 ounces of liquid. You use the lower half to determine the mean value that produces values greater than, or less than, a value you choose according to the probability you want. Here, we're using the model to find the machine setting required to have a 2% probability of a bottle containing less than 16 ounces. We've entered 16, the standard deviation of 0.2, and 0.02 are entered in range C14..C16. Cell C20 indicates that the bottle filler must be set at 16.411.



```
        H              I              J         K           L          M
1   FOR NORMAL DISTRIBUTION
2   ---------------------------------------------------
3   Constants                              Intermediate Calculations
4   a           0.049867347                z                1.5
5   b          0.0211410061                abs_z            1.5
6   c          0.0032776263                az          0.074801
7   d          0.0000380036                bz          0.047567
8   e          0.0000488906                cz          0.011061
9   f           0.000005383                dz          0.000192
10                                         ez          0.000371
11                                         fz          0.000061
12                                         sum         0.134055
13                                         p           0.066807
14
15  FOR INVERSE NORMAL DISTRIBUTION
16  ---------------------------------------------------
17  Constants                              Intermediate Calculations
18  g                 2.515517             adj_p           0.02
19  h                 0.802853             v           2.797149
20  j                 0.010328             hv          2.245699
21  q                 1.432788             jv          0.080806
22  r                 0.189269             sum_a       4.842023
23  s                 0.001308             qv          4.007722
24                                         rv          1.480849
25                                         sv          0.028625
26                                         sum_b       6.517197
27                                         comp_z      2.054188
```

FIGURE 2. This area of the normal-distribution worksheet contains ranges of constants (ranges I4..I9 and I18..I23) and intermediate formulas (ranges L4..L13 and L18..L27) needed to produce the results in the model's work area.

worksheet pertain to the bottling machine. We want to know the probability of a bottle containing more than 16.3 ounces, so 16.3 is entered in cell B5. We call the value in cell B5 X; it's the value for which we want to determine probabilities. The mean volume produced at the 16-ounce setting is 16, and that value appears in cell B6. Assume for now that you've already determined that the standard deviation is 0.2 ounces. This value appears in cell B7. If you're not familiar with the concept of standard deviation, read the box on page 60.

Cell F5 shows you the probability of randomly choosing a bottle that contains more than 16.3 ounces: 0.0668.

Cell F6 computes the probability of a value less than X occurring. You could also call this the area of the curve's left-hand tail. This is usually more relevant when X is less than the mean. What, for example, is the probability of a randomly selected bottle containing 15.8 ounces or less. Enter 15.8 in cell B5. Cell F6 returns 0.1587.

Note that it doesn't matter if we say "less than 15.8 ounces" or "15.8 ounces or less." This is because the random variable, the amount of liquid in a bottle, is continuous. It can be any value between zero and the capacity of the bottle. In practice, the probability is the same whichever way it's worded, although in point of fact 0.1587 is the probability of a bottle containing less than 15.8 ounces. This is because the probability of a bottle containing exactly 15.8 ounces, or any other specified volume, is 0.

You begin
the process of finding
normal probabilities
by standardizing
all the values.

Cell F9 computes the probability that a value won't differ from the mean by more than the difference between X and the mean. This is the area between equal portions of both tails of the curve. To find the probability that a randomly selected bottle will be within a half-ounce of 16 ounces, enter either 15.5 or 16.5 in cell B5. Cell F9 returns 0.9876.

The worksheet contains a second section called the Inverse Normal Distribution that lets you view a problem like this from another angle. Suppose you want to have only a 2% probability of a bottle containing less than 16 ounces of beverage. What setting would you use to be sure that this happens? Rows 11 to 20 of figure 1 answer the question by computing the so-called Z value. Z values will be discussed in more detail later in the article.

Enter the amount of the beverage that's supposed to go into each bottle in cell C14, the standard deviation in cell C15, and the desired probability in cell C16. You've already entered the values 16, 0.2, and 0.02, respectively, in these cells. Cell C18 computes the Z value, which is 2.054. Cell C20 computes the mean for which there's a 2% probability of a bottle containing less than 16 ounces: 16.411. That is, if the machine is set to 16.411 ounces, it will dispense less than 16 ounces only 2% of the time.

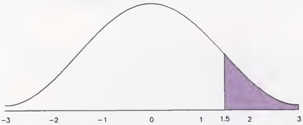
Let's say that if a machine dispenses more than 16.3 ounces, it will spill over and make the outside of the bottle sticky. Therefore, you want to have only a 2% probability that the machine will dispense more than 16.3 ounces. Enter 16.3 in cell C14, but look at cell F20 instead of cell C20. Cell F20 returns 15.889 (not 15.589 as in figure 1). If you set the machine to 15.889, only 2% of the bottles are likely to overflow. But that may mean that too many bottles will contain less than the 16 ounces indicated on the label. To find out, enter 15.889 in cell B6 and enter 16 in cell B5. Cell F6 shows that the probability of a bottle containing less than 16 ounces is 0.7106.

You might actually fare a lot better if you tolerate as much as a 5% overflow rate. Enter 0.05 in cell C16. Cell F20 now returns 15.971. Enter 15.971 in cell B6. According to cell F6, if you set the machine at 15.971, 56% of the bottles will contain less than 16 ounces.

HOW THE MODEL WORKS

Whether you're working with data that has a mean of 42,000 and a standard deviation of 1,596 or a mean of 12 and a standard deviation of 0.03, the normal curve is traditionally drawn starting at three standard deviations less than the mean and ending at three standard deviations more than the mean. This is because a value from a normally distributed population has close to 0 probability of differing from the mean by more than three times the standard deviation. For the bottling example, the mean is 16 and the standard deviation is 0.2, so the curve starts at 15.4, or $(16-0.2\times3)$, has 16 at the center, and ends at 16.6, or $(16+0.2\times3)$.

Whether you use a printed table or some computational method, you usually begin the process of finding normal-curve probabilities by standardizing all the values. You express the problem in terms of a normal curve with a mean of 0 and a standard deviation of 1. You draw this curve starting at -3, or $(0-1\times3)$, and ending it at $+3$, or $(0+1\times3)$. X is converted to Z, which is the position of X on the normal curve. In our bottling problem, finding the probability that a randomly chosen bottle will contain more than 16.3 ounces looks like this on a standardized curve:



You convert X to Z by using the following formula:

$$Z=\frac{(X-\text{Mean})}{\text{Standard Deviation}}$$

The formula in cell L4 in figure 2 converts X to Z in this manner. Cell L5 computes the absolute value of Z, which means it computes the numeral and ignores whether the result is positive or negative.

Once we compute the absolute value of Z, we can compute *p*, the probability that a randomly selected member of a population will have a value greater than Z (or less than Z if Z is negative). In the case of Meadowlark Beverages, *p* is the probability that a bottle will be filled with more or less than 16 ounces. The formula below finds *p* by using a progression similar to mathematical integration:

$$p=0.5(1+AZ+BZ^2+CZ^3+DZ^4+EZ^5+FZ^6)^{-16})$$

Note that Z in the formula indicates the absolute value of Z. A, B, C, D, E, and F are predetermined constants, and their values appear in range I4..I9 of figure 2. The constants have been known to mathematicians for years and are published by the National Bureau of Standards. Range L6..L11 contains formulas that multiply absolute Z by the constants and raise the product to the appropriate power. Cell L12, which is named *sum*, adds the results of these formulas together. Cell L13 computes *p* by raising (1+*sum*) to the negative 16th power, then multiplying the result by 0.5.

Cell F5 uses an @IF formula so that it returns *p* when Z

HOW TO SET UP THE NORMAL-DISTRIBUTION WORKSHEET

1. Individual column widths

Column	Width
C	20
I	16

For example, to set the width of column C, place the cell pointer in column C, and select

1-2-3: /Worksheet Column Set-Width, enter 20
Symph: MENU Width Set, enter 20

2. Cell formats

Format	Cells
Fixed 4	F5..F6, F9
Fixed 3	C18, C20, F20

For example, to set the format for range F5..F6, select

1-2-3: /Range Format Fixed, enter 4, specify range F5..F6
Symph: MENU Format Fixed, enter 4, specify range F5..F6

3. Labels

Enter all the labels shown in figure 1. Enter \= in cell A10 and copy cell A10 to range B10..F10. Enter all the labels shown in figure 2. Enter \– in cell H2 and copy cell H2 to ranges I2..L2 and H16..L16.

4. Values

Enter the values shown in figure 1 in ranges B5..B7 and C14..C16. Enter the values shown in figure 2 in ranges I4..I9 and I18..I23.

5. Range names

Use the labels in range A5..A7 to assign names to the adjacent cells in column B: Press slash (*Symph*: MENU), select Range Name Labels Right, and specify range A5..A7. Perform the same operation four more times, using these ranges: H4..H9, K4..K13, H18..H23, and K18..K27. Assign these additional range names:

Name	Range
dval	C14
std2	C15
prob	C16

For example, to assign the name to cell C14, press slash (*Symph*: MENU), select Range Name Create, enter *dval*, and specify cell C14.

6. Formulas

L4	(x – mean)/std
L5	@ABS(z)
L6	+ a*abs_z
L7	+ b*abs_z^2
L8	+ c*abs_z^3
L9	+ d*abs_z^4
L10	+ e*abs_z^5
L11	+ f*abs_z^6
L12	@SUM(L6..L11)
L13	0.5*(1 + sum)^ – 16
F5	@IF(z<0,1 – p,p)
F6	1 – F5
F9	1 – @MIN(F5..F6)*2
L18	@IF(prob<0.5,prob,1 – prob)
L19	@SQRT(@LN(1/(adj_p^2)))
L20	+ h*v
L21	+ j*v^2
L22	+ g + hv + jv
L23	+ q*v
L24	+ r*v^2
L25	+ s*v^3
L26	1 + @SUM(L23..L25)
L27	+ v – sum_a/sum_b
C18	@IF(prob<0.5,comp_z, – comp_z)
C20	+ dval + C18*std2
F20	+ dval – C18*std2

ABOUT STANDARD DEVIATION

Standard deviation is a measure of how widely individual values in a set of values are scattered from the mean. Consider one-pound boxes of cereal. It should be possible to fill a box so that it contains pretty close to a pound. Now consider two-pound bags of apples. The fruit packer doesn't put partial apples into bags to make them come out to exactly two pounds, so we expect a fair amount of dispersion, one way or the other. Therefore, the weights of boxes of cereal probably have a lower standard deviation than do the weights of bags of apples.

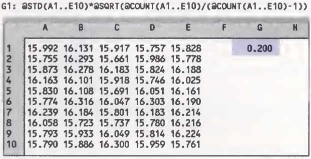
Computing standard deviations using *1-2-3* or *Symphony* is easy: Just use the @STD function. The format is @STD(*range*).

Be aware, though, that the @STD function is designed to be used with an entire population of data. For example, it wouldn't be difficult to record the heights of all boys in a school's fourth grade and compute the standard deviation of those heights. On the other hand, you could never expect to check the diameters of the thousands of ball bearings produced by a machine. Instead, you get a representative random sample and use it to estimate the standard deviation of the population. @STD(*range*), where *range* contains the sample values, gives you the standard deviation of the sample, which is probably somewhat less than the standard deviation of the population.

1-2-3 Release 3 includes the function @STDS, which is designed to be used with samples. With *Symphony* or any other release of *1-2-3*, you must adjust the standard deviation when working with samples. Divide the number of values in the sample by one less than the number of values in the sample, then take the square root and multiply the result of the @STD function by that value. To do this, use a formula like:

@STD(*range*)*@SQRT(@COUNT(*range*)/
(@COUNT(*range*) − 1))

The worksheet screen below contains the contents in fluidounces of 50 randomly chosen bottles from our imaginary bottling machine. The formula in cell G1 returns the standard deviation, computed with the assumption that the values in range A1..E10 comprise a sample. The equivalent formula for *1-2-3* Release 3 is @STDS(A1..E10).



```
G1: @STD(A1..E10)*@SQRT(@COUNT(A1..E10)/(@COUNT(A1..E10)-1))

        A      B      C      D      E      F      G      H
 1  15.992 16.131 15.917 15.757 15.828           0.200
 2  15.755 16.293 15.661 15.986 15.778
 3  15.873 16.278 16.183 15.824 16.188
 4  16.163 16.101 15.918 15.746 16.025
 5  15.830 16.108 15.691 16.051 16.161
 6  15.774 16.316 16.047 16.303 16.190
 7  16.239 16.184 15.801 16.183 16.214
 8  16.058 15.723 15.737 15.780 16.216
 9  15.793 15.933 16.049 15.814 16.224
10  15.790 15.886 16.300 15.959 15.761
```

is 0 or positive but returns $1 - p$ when Z is negative. Note that Z is negative whenever the value of X entered in cell B5 is less than the mean in cell B6.

The formula in cell F6 is simple: It subtracts the value in cell F5 from 1. Cell F9 takes the lesser of cells F5 and F6, multiplies it by 2, and subtracts the result from 1. You can think of this value as the area remaining if you exclude both tails of the normal curve.

The second section of the worksheet starts with the probability you want, which you enter in cell C16. It computes Z from this probability. We start with an @IF formula that returns the probability you enter in cell C16 only if that value is less than 0.5. Otherwise, the formula returns 1 minus the probability. Cell L18, which is named *adj_p* (for adjusted *p*), makes this computation.

Before converting *adj_p* to Z, we must covert *adj_p* to an interim value, which is called v. This value, v, is hard to define and its exact meaning isn't important here. It suffices to say that you convert *adj_p* to v by using the following formula:

$$v = \sqrt{\ln\left(\frac{1}{\text{adj\_}p^2}\right)}$$

The formula in cell L19 computes v in this way. Then, by using another set of constants, G, H, J, Q, R, and S, we compute Z using this formula:

$$Z = v - \frac{G + Hv + Jv^2}{1 + Qv + Rv^2 + Sv^3}$$

The constants are entered in range I18..I23. The formulas in range L20..L22 compute the upper half of the fraction, and the formulas in range L23..L26 compute the lower half. The formula in cell L27 finishes computing Z by subtracting the result of cell L22 divided by cell L26 from v. Cell L27 is named *comp_z* (for computed Z).

Cell C18 contains an @IF formula. It returns *comp_z* if the probability you enter in cell C16 is less than 0.5. Otherwise, it returns the negative of *comp_z*.

Cell C20 returns the mean for the preselected probability of getting the desired value or higher. This formula multiplies the Z value in cell C18 by the standard deviation in cell C15 and adds the result to the desired values. Finally, cell F20 returns the mean value that goes with the preselected probability of getting the desired value or less. This formula multiplies the Z value in cell C18 by the standard deviation in cell C15 and subtracts the result from the desired values. ■

Philip Pfaff is a professor of finance at Canisius College in Buffalo, N.Y.

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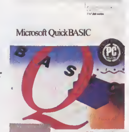

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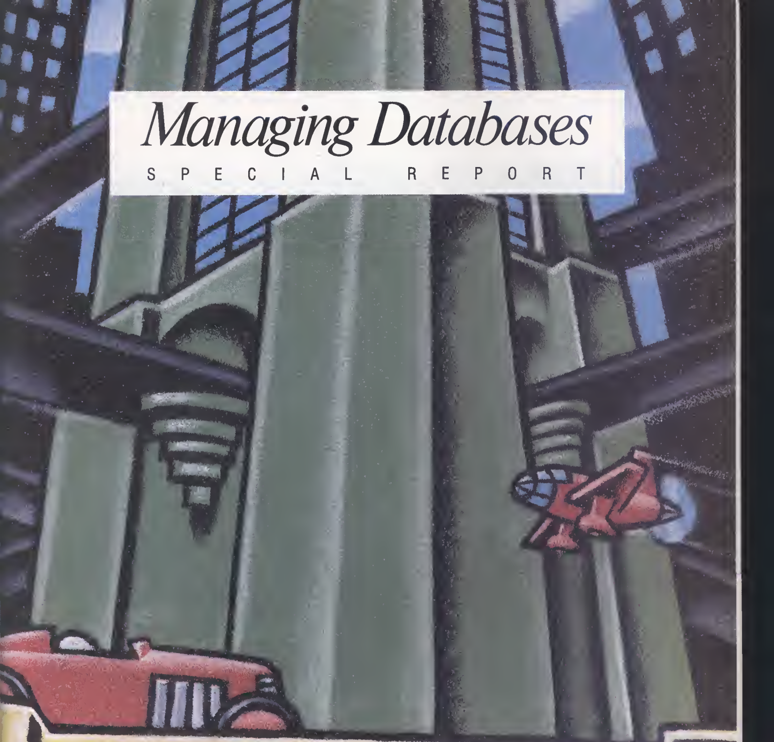
Managing Databases

SPECIAL REPORT



Spreadsheets and databases—different as they are structurally—make excellent complements: Databases store information, spreadsheets digest it. If you know how to handle a *1-2-3* or *Symphony* database but face more demanding database challenges, this report will help.

64 CHOOSE THE RIGHT DATABASE PROGRAM
How to know when 1-2-3 *or* Symphony *won't do the job—and what kind of database program to use*

67 THREE WAYS TO ANALYZE DATABASES
You don't need to master elaborate database operations to get the information you want.

70 QUERY EXTERNAL TABLES WITH 1-2-3 RELEASE 3
Improve your access to database information.

73 A FAST WAY TO BUILD DATA-ENTRY FORMS
The key is {FORM}, a new macro command in 1-2-3 *Release 3.*

77 CUSTOM REPORTS FROM SYMPHONY
Now you can go beyond the simple row-and-column format that Symphony *sets up automatically.*

81 DATABASE ADD-INS FOR 1-2-3
The help you need may be waiting in the database aftermarket.

DOUGLAS FRASER

CHOOSE THE RIGHT DATABASE PROGRAM

Learn when 1-2-3 *or* Symphony *won't do the job—and what kind of database program to use.*

Because *LOTUS* magazine exists primarily to extend the value of the software you already own, this special report focuses mainly on *1-2-3* and *Symphony*. Yet, depending on the nature of your database application, those programs may or may not meet your needs. So before we dive into our coverage of *1-2-3* and *Symphony*, we begin our report by helping you determine when to use Lotus's programs and when to choose an alternative. If your application requires that you look elsewhere, be sure to consider the database add-ins catalogued in our article on page 81.

To start our discussion, imagine that you have an application that requires you to set up and manage a database. If you own *1-2-3* or *Symphony*, either product is a natural place to start your search for a database program: Both products contain a database manager that you've already paid for. Further, if your database will either use spreadsheet data or generate data you wish to use in a spreadsheet, using *1-2-3* or *Symphony* eliminates any need to transfer the data between separate database and spreadsheet programs.

But *1-2-3* and *Symphony* have limits as database programs. If your application exceeds those limits, you should turn to one of two other types of database programs. One type consists of programs that work with one database table at a time. This type is known as a flat-file database program. Symantec Corp.'s *Q&A* and Borland International's *Reflex* are examples of this kind of program. The other type can work with multiple database tables and is known as a relational database program. Ashton-Tate's *dBase* and Microrim's *R:Base* are two examples.

Matching your application to the right kind of database program is a crucial decision. Buy too simple a program and either you won't get the job done, or you'll spend days writing macros or programs to circumvent the software's deficiencies. If your application later changes, you may not be able to revise your macros or programs adequately to handle its new scope. With too sophisticated a database program, you'll probably pay too much and saddle yourself with complexity that you don't need.

This article describes a series of typical database applications that are similar to ones you may face in the future. Those applications will help you to understand the limitations imposed by each program. Let's begin with an application you can handle by using *1-2-3* or *Symphony*.

A Simple Application

Let's suppose your company needs a customer-credit database. You have 600 customers, and you need to know four things about each of them: company name, identification number, amount owed, and credit status. You have to enter the names of new customers, modify customer data, rapidly access the credit-status information, and print three reports. One report is a list of customers whose accounts are delinquent. It is sorted by the amount owed. The other two reports are listings of customer information, one sorted by company name, the other by the identification number.

So far, your company's application appears to be a good candidate for *1-2-3* or *Symphony*. But there's only one way to know: Build a simple prototype to see if your solution works. That's easy to do. For example, you could enter the field names, define the basic ranges of the database, enter a few sample records, and copy the records in order to build a database of 600 records. Then do the same things with this database that you need to do with the real database. For example, enter customer names, retrieve credit-status information, and produce reports. If the prototype does what you want, clear the sample data and proceed with confidence.

If any of the operations you test with the prototype don't work well, you might try to fix things with macros. But using a dedicated database program may be a better solution. That's not to say that you shouldn't write macros. Just be wary of solutions that require extensive macros to simulate features available in other database programs.

Just how much can this application grow before it overwhelms *1-2-3* or *Symphony*? The answer depends on which release you use. To find your program's limits, let's consider a variation on this application. Your manager has requested a more extensive database. She wants you to store up to 10,000 entries, to track 70 fields of information for each customer, and to produce mailing labels and form letters. She also wants 30 custom reports.

Beyond the Limits

This application violates the first limits imposed by either *1-2-3* Release 2.01 or 2.2 or *Symphony*, namely physical size. In any of these programs, you must store your database in the worksheet, which would suggest you could store up to 8,192 separate entries, or records. However, you must allow one line for all the field names, which in our earlier example include *company name, identification number, amount owed,* and *credit status.*

In *1-2-3* Releases 2.01 and 2.2 and in all releases of *Symphony*, not only must your database reside on the worksheet but the worksheet must fit into available memory. You'll usually run out of memory before you fill 8,191 rows.

To give you an idea of what you can fit on your worksheet, do the following. While in a blank worksheet, press slash,

select Worksheet Status (in *Symphony*, press SERVICES and select Settings), and note how much available memory you have. Then enter a database of your own, extract some records to an Output range, and check memory again.

In *1-2-3* Release 3 memory limits are less important. Some programs, known as DataLens drivers, let Release 3 store records on the disk and then query them. The sample driver that accompanies Release 3 lets you do that with *dBase III Plus* files. Oracle Corp. offers a driver that lets you store data as an *Oracle* file and lets you query *Oracle* files. And Gupta Technologies makes a program that does the same for files in Gupta's database file format. Keep in mind, however, that if you use Release 3 to query such a file, the results must fit on the worksheet. Also, you can sort the data only while it resides on the worksheet.

For more about Release 3's database capabilities, consult "Query External Tables with *1-2-3* Release 3" on page 70.

Even if you were faced with many fewer records and thus no memory problem, this application might not work in *1-2-3* or *Symphony* because of its 70 fields of data. That many fields is no problem for *1-2-3* Release 3 or *Symphony* 2.0, which can handle up to 256 fields. But in *1-2-3* Releases 2.01 and 2.2 and in *Symphony* Release 1.2, you are limited to a maximum of 32 fields.

A final consideration regarding this application's suitability for *1-2-3* or *Symphony* is the need for custom reports. You can use *Symphony* to generate form letters, mailing labels, and custom reports such as invoices. But you need a macro to create form letters or mailing labels from *1-2-3*, and custom reports may require extensive macro programming.

DOUGLAS FRASER

So for a lot of reasons, this type of application calls for a stand-alone program that has been optimized for database management. In this case, we have assumed that all of the data is in a single table. So it would appear that a flat-file program can do the job.

Indeed, a competent flat-file program can store 65,000 records or more. Many of these programs can handle at least 128 fields. And most of them will help even a novice user design a customized report in a matter of minutes. After you set up a report in such a program, you can store its settings along with the settings for producing many other reports. You can then select the report settings you want from a menu.

The reason that a dedicated database program can store so many records is that it does not try to store them all in memory as *1-2-3*—prior to Release 3—and *Symphony* do. Instead it uses both RAM and the disk together.

Because a database program uses the disk, you will probably note a significant delay while data moves to and from the disk, especially when you work with large databases. The speed at which your database responds depends on the file's size, the speed of both your computer and your hard disk, and which database program you choose. Because such delays can be annoying, you'll do well to test whether the program you're considering works fast enough with the number of records you expect to use.

Many flat-file database managers let you index your file. Indexing is similar to sorting, but it lets you see your file in a rearranged sequence much more rapidly than if you were to sort the file. The larger your database, the more important indexing will be to you. In some of these programs, you can store multiple indexes and switch among them at will. And in some programs, indexing can screen out duplicate entries.

Relationships Among Tables

If your aspirations for this application go even higher, you should probably consider a relational database program. With such a program, you can store in one table general information about a customer, such as the company name and address. In other tables you can store the records of ordering and billing transactions. You can then generate reports that draw on data stored in more than one of those tables.

For example, you might combine order data with names and addresses to produce shipping labels for each order. Or you might combine order data, names, and outstanding balances to produce a report of any unpaid bills owed by those who have orders pending.

■

Sometimes the best solution is to use a dedicated database program together with the analytical features in 1-2-3 *or* Symphony.

■

Without a relational database program, you have to duplicate a great deal of your data. For example, if you want to print a shipping label for each order, you have to enter the customer's name and address for each label. In a relational program, you merely enter in a separate table the name, address, and identification number of each customer. Each time a customer places an order, you enter the customer identification number and the order. When the time comes to print labels for the order, the database program uses the customer ID number in the order table to retrieve the customer's name and address from the customer table.

Another deficiency of a flat-file program emerges when you need to store subsequent orders from the same customer. If you try to put all the orders in the same record, you have to create a separate field for each order. And you must reserve the same number of fields for the customer who orders least frequently as you do for the customer who orders most frequently. In some database programs, all those empty fields tie up a lot of disk space. Further, locating a particular order is cumbersome. With orders spread over several fields, it's hard to know which field to search.

To make matters even more difficult, suppose one of your product's descriptions has changed. For that change to be reflected throughout the database, you have to hunt down each occurrence of that description—every invoice, purchase order, and inventory table—and change it. With a relational database, a product description appears just once, in a table of product descriptions and specifications, where you can change it easily.

Combine and Conquer

Now that you're acquainted with each type of database, consider the possibility of using more than one type together. Since *1-2-3* and *Symphony* afford you analytical features absent in most dedicated database packages, sometimes the solution is to use a dedicated database program and *1-2-3* or *Symphony*. You may be able to transfer data between them using the Translate utility. Or you can store the results of your work with a database program in an ASCII file and then import that file into the worksheet using the File Import command. You can later export it to the database from the worksheet by printing it to a PRN file.

As you know from the earlier discussion of Release 3 and DataLens drivers, you might be able to use Release 3 to import and export the data with less fuss, depending on the dedicated database program you choose.

Once you know the type of database program you need, you can safely move ahead on choosing a particular product. Making that decision requires that you consider compatibility with your other software, how easy the program is to use, and any applicable software standards within your company. If you're thinking about an add-in database for *1-2-3* or *Symphony*, see the article "Database Add-Ins for *1-2-3*." ■

Prepared by the LOTUS *staff.*

3 WAYS TO ANALYZE DATABASES

You don't need to master elaborate database operations to get the information you want.

BY PAULA DEMPSEY

At the heart of any *1-2-3* or *Symphony* database is a spreadsheet. As a result, you can use many spreadsheet techniques and functions to analyze information stored in database format. This article describes how to create a database report by using database statistical functions and one-way and two-way data tables. In *Symphony*, data tables are known as what-if tables. Throughout this article, however, we'll use the terms one-way and two-way data tables. The advantages of these approaches are speed and simplicity. The payoff is more powerful analysis.

Figure 1 shows a typical arrangement of sales data in a spreadsheet. Each row contains information about an individual sale, including the order ID number, the sale date, the dollar amount, the region in which the sale took place, and the person responsible for the sale. Each column contains a specific type of information common to each sale. For example, column A collects order ID numbers, column B has sale dates, and column D has sale amounts.

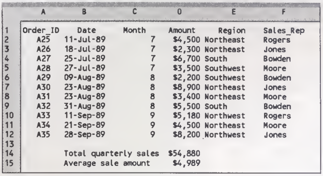
Simple statistical formulas located below the sales data calculate aggregate values. For example, an @SUM formula in cell D14 returns the total amount of sales for the third quarter. An @AVG formula in cell D15 returns the average amount of a third-quarter sale.

These formulas return a lot of useful information. But what if you want to perform a more detailed analysis of this sales data? For example, how might you analyze sales figures by region, by sales representative, by month, or by sales amount? You can perform these and many other types of analysis by using a variety of spreadsheet functions. In essence, you can link database concepts with spreadsheet operations to create informative and analytical printed reports.

Such a report appears in figure 2. It is a third-quarter sales report that incorporates database statistical functions and data tables. It requires that your data be arranged in *1-2-3*'s or *Symphony*'s database format. In order to select specific records, some of the calculations rely on Criterion ranges. If you need to review or become familiar with the basics of arranging data or using Criterion ranges, see "When Your *1-2-3* Database Goes Haywire" in the December 1988 issue of *LOTUS*.

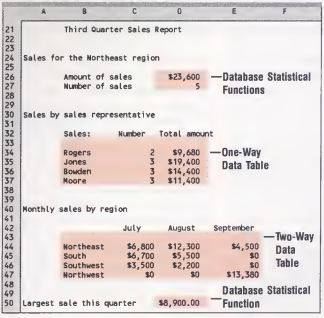
Arrange Data for Analysis

When you organize data in a spreadsheet, consider adding columns of information that will make subsequent



	A	B	C	0	E	F
1	Order_ID	Date	Month	Amount	Region	Sales_Rep
2	A25	11-Jul-89	7	$4,500	Northeast	Rogers
3	A26	18-Jul-89	7	$2,300	Northeast	Jones
4	A27	25-Jul-89	7	$6,700	South	Bowden
5	A28	27-Jul-89	7	$3,500	Southwest	Moore
6	A29	09-Aug-89	8	$2,200	Southwest	Bowden
7	A30	23-Aug-89	8	$8,900	Northeast	Jones
8	A31	23-Aug-89	8	$3,400	Northeast	Moore
9	A32	31-Aug-89	8	$5,500	South	Bowden
10	A33	11-Sep-89	9	$5,180	Northwest	Rogers
11	A34	21-Sep-89	9	$4,500	Northeast	Moore
12	A35	28-Sep-89	9	$8,200	Northwest	Jones
13						
14		Total quarterly sales		$54,880		
15		Average sale amount		$4,989		

FIGURE 1. This spreadsheet contains sales data arranged as a database. Each row collects information about an individual sale. Each column collects information about all sales. Range A1..F12 is named *input*. Formulas in cells D14 and D15 perform simple sales analysis.



	A	B	C	0	E	F
21		Third Quarter Sales Report				
22						
23						
24	Sales for the Northeast region					
25						
26		Amount of sales		$23,600		
27		Number of sales		5		
28						
29						
30	Sales by sales representative					
31						
32		Sales:	Number	Total amount		
33						
34		Rogers	2	$9,680		
35		Jones	3	$19,400		
36		Bowden	3	$14,400		
37		Moore	3	$11,400		
38						
39						
40	Monthly sales by region					
41						
42			July	August	September	
43						
44		Northeast	$6,800	$12,300	$4,500	
45		South	$6,700	$5,500	$0	
46		Southwest	$3,500	$2,200	$0	
47		Northwest	$0	$0	$13,380	
48						
49						
50	Largest sale this quarter			$8,900.00		

FIGURE 2. This sales report uses a variety of spreadsheet functions to analyze the data in figure 1. Database statistical functions in cells D26 and D27 return the dollar amount and number of sales for a sales region. A similar function in cell D50 returns the dollar amount of the largest sale in the current quarter. A one-way data table in range B33..D37 analyzes each representative's sales effort. A two-way data table in range B43..E47 analyzes sales by region and by month.

analysis easier. For example, since the sample report in figure 2 includes an analysis of sales by month, a column titled *Month* is included in the spreadsheet in figure 1. Column C contains the @MONTH(*date*) formulas, which return a number between 1 and 12, based on the month in which a sale took place.

It is also useful to assign a name to the range that contains the data. This range name serves two purposes. You can use it in various formulas to refer to the database. And you can use it in conjunction with the GOTO key to move quickly to the database from anywhere in the worksheet. In the example, the name *input* is assigned to range A1..F12. Note that this range includes the field names in row 1. If you append rows or columns to the database, you must expand the dimensions of the named range to include the additional rows and columns. *1-2-3* and *Symphony* ignore records outside the named data range.

1. *Analyze Data with @D Functions*

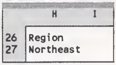
You may already have used simple statistical functions such as @SUM or @AVG. With these functions, you usually specify a range as the argument. For example, the formula @SUM(D2..D12) uses as an argument the range of values in the *Amount* column in figure 1. A variation on this theme occurs when you need to calculate total sales for a region, for a sales representative, or for a month. To perform these types of calculations, you use database statistical functions or, as they're more commonly known, the @D functions.

Each of the @D functions, except for @DQUERY in *1-2-3* Release 3, takes three arguments: *database*, *offset*, and *criterion*. The first argument, *database*, is the range that contains the data and field names.

The second argument, *offset*, is a value that indicates the field or column in the Database range that contains the data you want. To determine the offset value, you count from the leftmost column in the database to the column containing the values needed in the calculation. The database's leftmost column is numbered 0; the column immediately to its right is numbered 1; the next column to the right is 2; and so on.

An @D function's third argument, *criterion*, is the Criterion range. This argument specifies how the @D function determines which records to use in its calculation.

In the report in figure 2, cell D26 contains the formula @DSUM(input,3,crit1), which calculates the total sales for the northeastern region. The range named *input* encompasses cells A1..F12. The offset value is 3 because we want the @DSUM formula to examine the values in column D, the *Amount* field, which is three columns to the right. The Criterion range is the range named *crit1*. It occupies cells H26..H27, and it looks like this screen.



```
      H          I
26  Region
27  Northeast
```

To use range names in an @D formula, you must first assign the range name to a cell or a range. In this example, you would press slash (in *Symphony*, press MENU) and select Range Name Create, enter the name *crit1*, and specify range H26..H27.

1-2-3 and *Symphony* calculate the result of the @DSUM formula by using the criterion in cell H27 to select records from the range named *input*. In this case, the programs select only the records for the northeastern region, since *Northeast* is the criterion supplied in the Criterion range. As each record is selected, the values in the column specified by the offset, column D, are added together. The result is the total sales amount for the northeastern region.

The database statistical formula in cell D27 is similar to the one in cell D26. This formula, however, determines the number of sales that occurred in the third quarter in the northeastern region. The formula looks like this: @DCOUNT(input,1,crit1). Since the @DCOUNT function merely counts the records that match the criteria, it doesn't matter which field you specify as the offset value. You are merely interested in counting records.

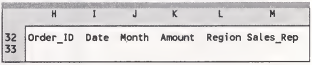
The Criterion range, *crit1*, is the same one used by the @DSUM formula in cell D26. When possible, it's a good practice to use the same Criterion range in different formulas. Doing so saves you the work of entering a new Criterion range and keeps the worksheet smaller so that it uses less memory. When you base several formulas on the same Criterion range, be careful not to make changes in criteria that may affect the results of other formulas.

2. *Use Data Tables*

The preceding examples showed you how to find the total amount and total number of sales for the northeastern region. But suppose you want to calculate these values for every region or, as in the following example, for every sales representative. To calculate these results quickly, you can create a one-way data table like the one in range B33..D37. It presents each sales representative's total number and total amount of sales.

To set up this data table, you enter the names of sales representatives in range B34..B37, the first column of the table. You must leave the upper-left cell in the Table range blank. In the example, that is cell B33.

Next you must set up a Criterion range. Since you want to examine all the records in the database, you need to set up a Criterion range that does not contain any limiting criteria. This enables all the records to be selected and tallied. This Criterion range, named *crit2*, looks like the following screen.



```
       H        I      J        K        L        M
32  Order_ID  Date  Month  Amount  Region Sales_Rep
33
```

The best way to create field names for a Criterion range is to copy them from the database. This eliminates mismatches that are caused by typing errors. And since this example has six field names, copying is also quicker. In order to create this Criterion range, you copy range A1..F1 to cell H32. Then use the Range Name Create command to assign the

name *crit2* to range H32..M33.

Once you've created the Criterion range, you enter in the first row of the table one @D function for each type of calculation you want. In this example we calculate the number of entries in the range and the sum of those entries. In cell C33 we enter the formula @DCOUNT (input,1,crit2), and in cell D33 we enter the formula @DSUM(input,3,crit2). The results of these formulas do not appear in the figure because the Hidden format is assigned to cells C33 and D33. This prevents the formulas from cluttering the appearance of the report.

To calculate the values in the table, use the Data Table 1 (in *Symphony*, MENU Range What-If 1-Way) command. Specify range B33..D37 as the Table range. Note that you do not include in the Table range the labels in row 32. They are provided for clarity. The program does not use them in calculations.

Next, *1-2-3* and *Symphony* prompt you for the input cell, which is the cell into which the program sequentially copies each sales representative's name when it generates the table. Since the table is organized according to the names of the sales representatives, the input cell is the cell in the Criterion range under the field heading *Sales_Rep*. This is cell M33.

Once you specify the input cell, the program copies *Rogers*, the first name in the list, into the input cell. It then calculates the values of @DCOUNT and @DSUM for this name and places the results in cells C34 and D34. The program continues to calculate the results of the @D formulas for each sales representative, and places the results in the table. While the calculations are being made, the screen display is not updated. Once *1-2-3* and *Symphony* finish calculating all the values in the table, they display the results.

If you change, add, or delete records in the Database range, you must recalculate the table. It is not updated automatically. If you add records to the Database range, be sure to expand the range to include the additional records.

Symphony users must select the Range What-If 1-Way command to update the table. *1-2-3* users can reissue the Data Table 1 command or press the TABLE key and the data table will recalculate instantly.

3. *Use a Table for Two-Way Analysis*

As you might guess, you can set up a two-way data table to analyze data according to two data fields. For example, a two-way data table in range B43..E47 analyzes third-quarter sales by region and by month.

To set up this table, you enter the names of regions in the first column of the table, leaving the cell in the upper-left corner of the table blank. Next you enter the month numbers in the first row of the table, leaving the leftmost cell in this row blank. In the report, we've entered month names in row 42. They are not part of the table but are supplied for clarity.

In the example, the month number corresponding to July, 7, is entered in cell C43, 8 in cell D43, and 9 in cell E43. These cells are then assigned the Hidden format to keep their contents from appearing in the report.

Now enter the formula @DSUM(input, 3,crit2) in cell B43, which is in the upper-left corner of the table. In the example this cell is also assigned the Hidden format. As in the one-way data table, the Criterion range in this example should not contain any criteria, since you want all records to be selected for the report.

To calculate the values in the table, select /Data Table 2 (in *Symphony*, MENU Range What-If 2-Way). Specify cells B43..E47 as the Table range, cell L33 as the first input cell, and cell J33 as the second input cell.

The program copies each label listed in the first column of the table into the first input cell. That's why you specify cell L33, which is in the Criterion range under the field name *Region*. The second input cell is where the program copies each month number listed in the first row of the table. This is cell J33, the cell in the Criterion range under the field name *Month*.

Once you enter the second input cell, the program starts calculating the table values. It copies the label *Northeast* and the month number 7 to the two input cells. Using these criteria, it calculates the first @DSUM formula and places the result in cell C44. The rest of the formulas are calculated in a similar manner until the table is complete.

As in the one-way table, if you change information in the database or add records to it, you must recalculate the table. In *1-2-3* press the TABLE key or reissue the Data Table 2 command. In *Symphony*

DOUGLAS FRASER

reissue the Range What-If 2-Way command to update the table values.

@MAX or @DMAX?

We've made a lot of progress in analyzing this sales data. Now let's return to the database statistical functions for a final bit of analysis.

To find the amount of the largest sale in the database, you can use either the @MAX or @DMAX function. The @MAX function's syntax is @MAX(*list*); the @DMAX function's syntax is @DMAX (*database,offset,criterion*). At first glance it might seem easier to use @MAX. It takes only one argument rather than three. But in order to specify that argument, you must look up the exact dimensions of the range of values that @MAX will evaluate. In this case, that's the range containing the values in column D, the *Amount* column. And if the database is large, determining the range takes time. Since this worksheet already contains a Criterion range that the @DMAX formula can use, it's faster to use @DMAX.

To find the largest sale in the third quarter, you can enter @DMAX(input,3, crit2) in cell D50. You use the Criterion range named *crit2* because it does not contain any criteria. This means that the @DMAX formula will examine all records in the database when looking for the largest sale amount. If you want to find the highest sale for the northeastern region, use the Criterion range *crit1*. It contains the criterion *Northeast* under the field name *Region*. Change this criterion to *South*, and you can determine the largest sale in the southern region.

The techniques covered in this article allow you to conjoin spreadsheet operations with data analysis and reporting without requiring you to be a database expert. You can easily incorporate these techniques into your existing spreadsheets if your data are arranged in tabular format. And with a bit of experimenting, you may discover other spreadsheet functions that let you analyze your data in creative ways. ■

Paula Dempsey, a frequent contributor to LOTUS, *wrote a primer on @functions in September's Special Report on formulas.*

QUERY EXTERNAL TABLES WITH 1-2-3 RELEASE 3

Improve your access to database information.

DOUGLAS FRASER

BY JUSTIN FIELDING

If you use database software other than *1-2-3*, you may want to import selected data into a spreadsheet. Chances are your database program can't match *1-2-3*'s aptitude for calculations. And few, if any, database programs are as flexible as *1-2-3* for manual control of report formats.

Unfortunately, importing and exporting data can be cumbersome and frustrating. *1-2-3* Release 3 offers a convenient and powerful alternative to traditional data import and export.

With Release 3's Data External commands, you can treat an external database table as if it were a conventional *1-2-3* database Input range. You use ordinary Criteria and Output ranges to extract the desired records and fields from a table. The database you query can be of almost any size, but the information that you extract into the worksheet cannot exceed *1-2-3*'s constraints on memory size and the number of fields and records.

The Data External commands let you manipulate the database itself. Within *1-2-3* you can create, delete, and modify tables in a database. Like other features of Release 3, the Data External commands support multiple-table, or "relational," databases. You can even issue commands in the command language of the program that created the database.

The exercises that follow demonstrate how to query an external table. Future articles will address some of the more advanced ways in which *1-2-3* can control external database files.

What You Need to Know

To use the Data External commands, you need some understanding of *1-2-3* database fundamentals, as well as an understanding of the program that created your database. Although the examples here import data from *dBase III Plus*, you don't have to know about *dBase III Plus* to do the exercises.

Release 3 comes with SAMPLE, a driver that helps *1-2-3* work with *dBase III Plus* files. It also comes with a *dBase* practice file called EMPFILE.DBF. The driver is called SAMPLE because it offers a limited set of external database commands. It does, however, support all of the essential features.

If *dBase* is your main point of reference for database terminology, a few terms used by the Data External commands may bear explanation. In *dBase III Plus*, each table of data is stored in a separate file. You generally identify a *dBase* database by the names of its component files.

The Data External commands use terminology that is more familiar to users of SQL-based relational databases, such as *Oracle*. In these systems, tables rather than files are the essence. The actual names and structures of the files are neither apparent nor relevant to the user. What *Oracle* users call a database is somewhat analogous to a subdirectory that contains all of the files in a *dBase* application. To the Data External commands, a database is the location where the data is stored.

If you're preparing to query a *dBase* database and *1-2-3* asks you to specify an external database, enter the name of the subdirectory that contains the database files. When you're asked to provide a "table" name, indicate a .DBF file name.

Note that in *1-2-3* Release 3, the term "database table" is often used instead of "database" or "Input range," because the database you query may consist of more than one table. An "external table" is the part of a database that you access via Data External commands.

Setting Up a Link

Let's use SAMPLE and the EMPFILE.DBF file to see how Data External commands work.

Start with a blank worksheet with the cell pointer in cell A1. Since you're just going to use worksheet A, you don't need to use Release 3's 3-D notation (for example, specify A1 instead of A:A1).

The first step in working with an external table is to press the slash key and choose Data External Use. *1-2-3* takes you through the steps of identifying the table you want to use.

■

> *With Release 3's Data External commands, you can treat an external database table as if it were a conventional* 1-2-3 *database Input range.*

■

The names of the drivers you have installed appear in the control panel. Select SAMPLE.

Next, identify the database. For *dBase* databases, this is the subdirectory that contains the database file. If you installed *1-2-3* using the default settings, subdirectory C:\123R3 contains the *dBase* test file EMPFILE.DBF. Select C:\123R3, or whichever directory contains your copy of EMPFILE.DBF.

Now, highlight the table (or "file" in *dBase* parlance) name EMPFILE and press Return. Press Return again to accept *Empfile* as the range name for the external table. You now have access to an external database table.

The first three steps of the Data External Use command provided the same prompt: *Enter name of table to use*. These three steps helped you build a "full table name," which consists of the names of a driver, an external database, and an external table. The full table name is the combination of these elements, separated by spaces. Some database systems require one additional element, an "owner name," but it is not needed with *dBase* and SAMPLE.

If you prefer, you can enter the full table name in one step. After you select /Data External Use, enter *sample c:\123r3 empfile.dbf*. Then type *empfile* and press Return to supply a range name for the external table.

Now that you have established a link to the external table, you need to build your Criteria and Output ranges. You could type in the field names, but that would require you to remember the exact spelling of the field names in the *dBase* file. Instead, choose List Fields (if the Data External menu is not current, press slash and select Data External List Fields).

The Data External List Fields command requests the range name of the external table. Press Return to select *empfile*. Press Return a second time to place the field information in cell A1 and its neighboring cells. You should now see a table definition in range A1..F6. Choose Quit to exit the Data External menu.

The table definition contains six columns of information about the external table. Not all of the columns are relevant to all external programs and their related drivers. The SAMPLE *dBase* driver uses only the first three: field names, data types, and field widths. The other columns are for column labels, field descriptions, and field-creation strings.

The only column that you're concerned with at this time is column A, which contains the field names. Since the field names are arranged vertically, you need to do a bit of reorganizing if you want to use them in Criteria and Output ranges. To erase the other columns, select /Range Erase and indicate range B1..F6. Next, with the cell pointer in cell A1, choose /Range Trans, type A1..A6, and press Return twice. Now, the field names are in a row, ready to be used as a Criteria range. You don't need the extra copies of the field names in range A2..A6. Select /Range Erase and indicate range A2..A6.

The Output range is easy to set up.

Copy the labels in range A1..F1 to cell A5.

Now you're ready to specify the location of the various database ranges. Select /Data Query Criteria, and specify range A1..F2. Then choose Output from the Data Query menu and indicate range A5..F5. Remember that any data entered below the Output range will be erased if you perform a Data Query Extract or Data Query Unique command.

Finally, you need to identify the location of the Input range. Here's where you start to see the Data External command in action. Instead of identifying cells in the current worksheet, you'll identify the external table as your Input range. Choose Input from the Data Query menu, press the NAME key (F3 on most computers) for the list of range names, highlight EMPFILE, and press Return.

■

Use the external table as you would any other 1-2-3 *database Input range.*

■

Using the External Table

From here on out, you can use the external table like any other *1-2-3* database Input range.

If the Data Query menu is still on the screen, choose Extract (otherwise, select /Data Query Extract) and select Quit. Because there are no criteria in the Criteria range, your Output range now contains a copy of the entire contents of EMPFILE.DBF. Select Quit.

Suppose you want to see only the employees whose last names begin with M. Enter the label M* in cell B2. After you press Return, press the QUERY key, which is F7 on most computers. If you're not familiar with the QUERY key, it's a shortcut for repeating the last Data Query command—in this case, Data Query Extract. Now the Output range includes only the employee records that match the current criteria.

If you're a seasoned user of *1-2-3* databases, you may see a potential problem with using an Input range that's not on the worksheet. Some formulas in a Criteria range refer to the second row of the Input range (the first row that contains data), such as +Z99<1987. Many people use the Range Name Labels Down command to assign the field names at the top of an Input range to the first data row, so they can write formulas like +DEPTNUM>3000. Since the external table doesn't actually reside in the worksheet, there's no way to assign range names to parts of it. Although the Data External Use command does not actually assign range names to the fields, criterion formulas can use field names from the external table as if they were range names.

Now use the Range Erase command to erase cell B2. Move the cell pointer to cell F2 and enter +DEPTNUM>3000. After you press Return, press the QUERY key to perform another Data Query Extract operation. An ERR indicator appears in cell F2, but it is of no significance. *1-2-3* treats this formula as an error because it refers to a range name that doesn't really exist. The formula, however, serves its purpose during a Data Query command, and your Output range now contains a list of employees whose department number is greater than 3000.

Keep in mind that some queries with large databases might require a larger Output range than *1-2-3* can accommodate. Some database commands, such as the Data Query Find command, aren't practical with an external table. And if you experiment with the more advanced Data External features, remember that some of them aren't supported by the SAMPLE driver. ■

Portions of this article appeared in a different form in the Fall 1989 issue of Lotus Quarterly.

INTRODUCING DATALENS

If you ever have had to convert data files from one program to another, you know it usually isn't easy. Often data conversions require you to switch back and forth between programs, perform extensive file alterations, and use special conversion utilities. Then you try to clean up the results without too much manual intervention.

Lotus Development Corp.'s DataLens technology offers a more sophisticated link between applications than conventional importing and exporting. For example, it enables you to modify data created with a separate database package, even if the information resides on a remote mainframe computer or on a network file server.

1-2-3 Release 3 is the first product to include DataLens. Release 3's Data External commands let you use DataLens by way of *1-2-3* menu choices. Several forthcoming Lotus products will also support DataLens, including *1-2-3/G*, Lotus's graphical spreadsheet for OS/2, and *1-2-3/M*, the version of *1-2-3* for IBM mainframes.

Lotus markets a toolkit that helps software publishers make DataLens drivers, which are programs that oversee the translation of data and commands. One benefit of DataLens is that a given driver works with all DataLens-compatible software on the same system. If you have a DataLens driver for your database program, you can use your database files with any other program that supports DataLens.

The SAMPLE driver included with *1-2-3* Release 3 gives you access to *dBase III Plus* files, but if you use a different database program, you'll need to acquire the appropriate driver. Oracle Corporation, Gupta Technologies, Microrim, Novell, Teradata Corp., and Computer Corporation of America have announced their intention to produce DataLens drivers. And Lotus has announced that drivers are in development for Sybase's SQL server, IBM's Extended Edition Data Manager, and Borland's *Paradox*. At press time, however, none of these drivers were available.

Lotus provides a toll-free number for information about the availability of DataLens drivers: 800-343-5414, from 8:30 A.M. to 8:00 P.M. Eastern time.

A FAST WAY TO BUILD DATA-ENTRY FORMS

The key is {FORM}, a new Release 3 command.

BY KELLY CONATSER

Many *1-2-3* users have overlooked their spreadsheets' advanced database functions because the program has lacked all but the simplest tools for entering and editing data. To meet the need for a better way to perform these tasks, the designers of *1-2-3* Release 3 created the {FORM} macro keyword. This command lets you set up a simple, foolproof data-entry system in a fraction of the time required by other releases of *1-2-3*.

At its most basic, the {FORM} command requires a data input range as its single argument and performs the same function in a macro routine as the Range Input command. The {FORM} command has the syntax {FORM *input_location*, [*call_table*],[*include_list*],[*exclude_list*]}. Before running a macro that contains the {FORM} command, you must use the Range Unprot command to unprotect the cells that will receive data. Then when the macro encounters the {FORM} command, it suspends macro execution and waits for someone to enter data in the range that you have specified. When input is complete, the macro continues processing.

The advantage of the {FORM} command lies in the way its optional arguments can be used to reduce user error and speed the data-entry process. And when used with its related commands {APPENDBELOW} and {APPENDRIGHT}, the {FORM} command lets you copy values from computed fields in your input area directly into your database.

Data Entry Using {FORM}

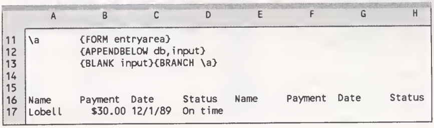
Later we will consider an example of a customized data-entry form. But to better understand how the {FORM} command works, we'll first look at a simple version of a data-entry form that has a database adjacent to the input area. The following steps lay the groundwork for basic data entry using {FORM}.

Enter the labels in range A11..D17 of figure 1. Enter 30 in cell B17 and the label '12/1/89 in cell C17. Next, copy range A16..D16 to cell E16. Then press slash, select Range Unprot, and specify range A17..D17. Assign the Currency 2 format to cell B17. Finally, use the Range Name Create command to assign the following range names:

Name	**Range**
\a	B11
entryarea	A16..D17
input	A17..D17
db	E16..H16

To run this simple {FORM} macro, hold down the MACRO key (Alt on most computers) and press A. Since you already have an entry in *input*, press Return. The macro expands the range

FIGURE 1



```
          A         B         C         D         E         F         G         H
11  \a        {FORM entryarea}
12            {APPENDBELOW db,input}
13            {BLANK input}{BRANCH \a}
14
15
16  Name      Payment  Date     Status    Name      Payment  Date      Status
17  Lobell      $30.00 12/1/89  On time
```

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named *db* and copies the record from the range named *input* in columns A through D to *db* in columns E through H. Enter another record in *input*:

Cell	**Entry**
A17	McBride
B17	22.5
C17	'12/1/89
D17	On time

After you enter *On time* in cell D17, press Return. This second record is copied to the database. Hold down the Control key and press Break to exit the macro, then press Escape to clear the resulting error.

Here's how the macro works:

{FORM entryarea} positions *entryarea* on your screen if it isn't currently visible. The command then moves the cursor to the first unprotected cell in *entryarea*. As with the Range Input command, pressing Return directly after entering data in any cell in *input* causes the {FORM} command to stop. When this happens, macro control passes to the line below the {FORM} command.

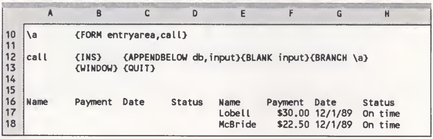
{APPENDBELOW db,input} copies the data you just entered in *input* to *db*. It also automatically expands *db* down one row to include the new record.

{BLANK input}{BRANCH \a} erases *input* and restarts the macro. These commands create the kind of looping macro that is useful for repetitive, large-scale data-entry projects.

Redefine Keys by Using Call Tables

This simple macro demonstrates the need for at least one optional argument. That's because there's no way to stop the data-entry macro except to hold down the Control key and press Break, which creates an error. To deal with this problem, we'll use {FORM}'s first optional argument, *call_table*.

A call table is a two-column range that lets you redefine any key on the keyboard when you use the {FORM} command. Macro commands in the right column of the call table are associated with the adjacent key or keyword in the left column of the call table. Pressing one of the keys listed in the left column causes only the macro commands in the same row to be processed. Macro processing doesn't continue down the column as you might expect.



```
          A         B         C         D         E         F         G         H
10  \a        {FORM entryarea,call}
11
12  call      {INS}     {APPENDBELOW db,input}{BLANK input}{BRANCH \a}
13            {WINDOW} {QUIT}
14
15
16  Name      Payment  Date      Status    Name      Payment  Date      Status
17                                         Lobell      $30.00 12/1/89   On time
18                                         McBride     $22.50 12/1/89   On time
```

FIGURE 2

Figure 2 illustrates how you might set up a call table. To alter your worksheet to match figure 2, move the contents of range A11..B11 to cell A10. Then move the contents of cell B12 to cell C12. Erase cell B13. Edit cells B10 and C12 to match the figure, and enter the following labels into the cells indicated:

Cell	**Label**
A12	call
B12	{INS}
B13	{WINDOW}
C13	{QUIT}

When the {FORM} command encounters a call-table argument, it checks the named range containing the keys and keywords you are allowed to use to execute a special macro command. These keys and keywords reside in the left-hand column of the call table. So to assign the range name *call*, select /Range Name Create, enter *call*, and indicate range B12..B13.

This revised macro retains the {APPENDBELOW}, {BLANK}, and {BRANCH} commands of the first macro, but they are now assigned to the Insert (Ins) key. Press MACRO-A and enter the following new record:

Cell	**Entry**
A17	Zschau
B17	15
C17	'12/15/89
D17	Late

Press Return a second time after you've entered *Late* in cell D17, and you'll find that you have terminated the {FORM} command without copying the new record to the database. The Ins key now controls insertion of the record that is in *input* into range *db*. Start the macro again, but this time press the Ins key to move the record to *db*. Then press Return twice to end the macro.

"Include/Exclude" Lists

If you set up your macro as we've just described, an inexperienced user could spend a lot of time restarting the macro after accidentally terminating it. Luckily, the {FORM} command also allows you to disable any key, giving you more control over the data-entry process. Because we'll be using this feature to disable the Return key, we've included a {QUIT} command as one of the options in our call table. That way, you'll be able to press the WINDOW key to exit the macro.

To enable or disable specific keys, {FORM} relies on its other two optional arguments, *include_list* and *exclude_list*. You can use only one of the two in any given {FORM} command. To enable only a few keys on the keyboard—numerals, for example—you use an include list. The syntax for such a {FORM} command is {FORM *entryarea,call,include*}, where *include* is the named range of the numerals (entered as labels) that you want to use during data entry. An include list restricts you to using only the keys you specify. Therefore, you also have to include at least one cursor-movement key in the include list to enable you to move around the range where you input data.

Since you're more likely to want to disable only a few keys, an exclude list may be more convenient. Edit the {FORM} command in cell B10 so that it matches the following command:

```
{FORM entryarea,call,,exclude}
```

A macro command containing two consecutive commas may appear a little strange to veteran *1-2-3* users. The sýntax of the {FORM} command varies depending on what combination of optional arguments you are using. This {FORM} command leaves out the second optional argument, the include list. This omission is indicated by an extra comma between the first and third optional arguments. Page 4-40 of the Release 3 reference manual lists the proper syntax for other combinations of optional arguments.

We'll enter the exclude list above the macro to make sure it doesn't interfere with our database. Enter the following labels in your worksheet:

Cell	**Label**
A8	exclude
B8	~

Assign the label in cell A8 as the range name for the adjacent cell in column B by selecting /Range Name Labels Right and indicating cell A8.

Now run the macro and enter the following record:

Cell	**Entry**
A17	White
B17	15
C17	'12/20/89
D17	Late

If you press Return after typing the entry for any of the four fields, the computer beeps and nothing happens. That's because we have disabled the Return key by putting a tilde (~) in the *exclude* range. No matter how many times you press Return, you won't exit the macro. The only way to get out of the data-entry loop is to do so deliberately—by pressing the WINDOW key that we have redefined. (The Escape key also lets you exit a {FORM} command, but you can disable this key in the same way that you disabled Return.) To enter data in the *input* range, use the RightArrow key. When you've finished entering this data, press the Ins key to move this record to the database.

No special syntax is needed to use additional alphanumeric or function keys in the *exclude* range. For example, to expand the list to exclude any entries containing a capital *A*, you would modify cell B8 to read ~A. In addition to disabling the Return key, the macro would not allow you to type a capital *A* anywhere in the database, though you still could include a lowercase *a*. You can exclude numerals and function keys in a similar manner.

Observing a couple of rules can help you avoid confusion when using {FORM} for data entry. If you're writing a data-entry macro for others to use, you'll probably want to set up your *entryarea,* which includes *input*, and *db* ranges in separate parts of the worksheet to avoid tempting people to alter your database. Be aware that if you do erase a record without deleting that row from the worksheet, a blank row will remain in the database. And be sure that nothing is in the rows below your range named *db*. {APPENDBELOW} won't write over data. The error message *Cannot write over data with APPEND commands* occurs when the new record is going to be copied to a row that contains data.

Default Entries

In many data-entry projects, a good deal of repetitive entry can be automated with the right tools. Two such tools, default entries and computed fields, are readily available if you use the {FORM} command.

Let's say that our sample database tracks dues payments of club members. We know that most members make their payment on the first of the month. Payments that meet this deadline are on time; those that don't are late.

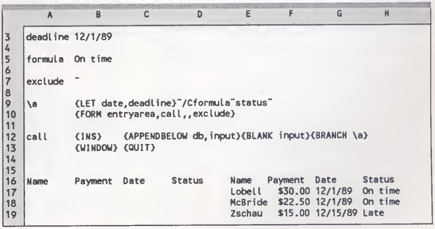
Up to now we have manually entered all the information in the *Date* and *Status* fields. Figure 3 shows how *1-2-3* can do this work. Press the WINDOW key to exit the macro and then modify your worksheet to match figure 3: Move the contents of range A8..B8 to cell A7 and move the contents of cell A10 to cell A9. Enter the labels shown in cells A3, B3, A5, and B9. Make sure that you enter the date in cell B3 as a label. Assign the labels in column A as names for the adjacent cells in column B: Select /Range Name Labels Right and indicate range A3..A9. Select /Range Name Labels Down and indicate range A16..D16. Select /Range Prot and indicate cell D17. Then enter the following formula in cell B5:

```
@IF(@DATEVALUE($date)>
   @DATEVALUE($deadline),"Late",
   "On time")
```

Run the macro by pressing MACRO-A. The default date entry and formula are automatically copied into the form. The {FORM} command then takes over, but now data entry is restricted to range A17..C17 because we protected cell D17.

The Return key is still disabled by our exclude-list range, so use the Arrow keys to enter any name and amount in cells A17 and B17. Then move the cell pointer to cell C17. If this payment arrived on a

FIGURE 3



```
        A         B         C         D         E         F         G         H
 3  deadline 12/1/89
 4
 5  formula  On time
 6
 7  exclude  ~
 8
 9  \a       {LET date,deadline}~/Cformula~status~
10           {FORM entryarea,call,,exclude}
11
12  call     {INS}    {APPENDBELOW db,input}{BLANK input}{BRANCH \a}
13           {WINDOW} {QUIT}
14
15
16  Name     Payment  Date      Status      Name    Payment  Date      Status
17                                          Lobell   $30.00 12/1/89   On time
18                                          McBride  $22.50 12/1/89   On time
19                                          Zschau   $15.00 12/15/89  Late
```

date other than the expected default of December 1, you would have to edit or reenter this cell. To edit cell C17, press the EDIT key and change the entry to read 12/3/89. Use the UpArrow or DownArrow key to get out of EDIT mode, since Return is part of our exclude list.

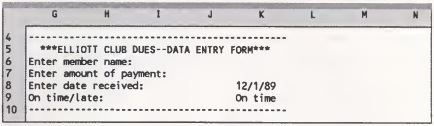
As soon as you enter the new date in cell C17, the @IF formula in cell D17 returns a different result to indicate that the payment is late. Now press the Ins key. The entire entry, including the string generated by the computed field in cell D17, is copied to *db*. The macro enters the default date and the @IF formula into range C17..D17 and waits for the next record to be entered. Press the WINDOW key to exit the macro.

Familiar Data-Entry Forms

What if you want a more traditional-looking data-entry window, like the one in figure 4? If you're designing a {FORM} macro for data-entry personnel who have become accustomed to this format by using *Symphony* or other database programs, you may feel it's important to keep the routine of moving up and down through the fields in a record. With a few minor adjustments, a vertically oriented entry form can work with {FORM} and its related commands.

For a small database that has, say, fewer than 250 records, you have the option of inverting the database and substituting the {APPENDRIGHT} command for the {APPENDBELOW} command. You would re-create your *entryarea, input*, and *db* ranges so that they are vertically rather than horizontally oriented, select /Range Unprot to unprotect the new *input* range, and substitute the {APPENDRIGHT} command for {APPENDBELOW}. If you used a specialized macro such as the one in figure 3 for computed or default fields, you would also re-create the range names involved to correspond to the appropriate cells in the new *input* range.

The usefulness of {APPENDRIGHT} is limited if you have to analyze or restructure your database. *1-2-3*'s Data commands and database statistical functions are based on a records-in-rows data structure, not the records-in-columns structure created by {APPENDRIGHT}.



```
         G        H         I        J         K        L         M        N
4   ---------------------------------------------
5     ***ELLIOTT CLUB DUES--DATA ENTRY FORM***
6   Enter member name:
7   Enter amount of payment:
8   Enter date received:                  12/1/89
9   On time/late:                         On time
10  ---------------------------------------------
```

FIGURE 4

The quickest way to transpose data from a columnar entry form like the one in figure 4 to a traditional records-in-rows database is to use a row of simple cell-referencing formulas. Such formulas transfer the data from vertical to horizontal orientation without using the Range Transpose command. To see how this works with the new entry form in figure 4 and our *db* range of figure 3, enter the labels shown in figure 4, excluding the entries in cells K8 and K9. Begin the entry in cell G5 with two spaces. To create the dashed lines, enter a backslash and a hyphen in cell G4 and copy cell G4 to ranges H4..K4 and G10..K10. Then add the following formulas to your worksheet:

Cell	**Formula**
E14	+K6
F14	+K7
G14	+K8
H14	+K9

These formulas evaluate to zero. We will have more on their function later.

Select /Range Name Create to assign the name *input2* to range E14..H14. Then reassign the following range names:

Name	**Range**
entryarea	G4..K10
input	K6..K9
date	K8
status	K9

Select /Range Unprot and indicate cells K6..K8. Use the Range Format command to set the format of cell K7 to Currency 2. Then edit the {APPENDBELOW} statement in cell C12 so that it looks like the following statement:

```
{APPENDBELOW db,input2}{BLANK
  input}{BRANCH \a}
```

Press the PageDown key twice to get to a blank screen. Then press MACRO-A in order to see how the {FORM} command positions the new *entryarea* range on the screen and how it places the cursor in the first cell of *input* (cell K6) to await data entry.

Now enter any record by using the DownArrow key to move from field to field. When you enter a name in the *Name* field, you'll see the corresponding cell in *input2* (in this case, cell E14) change to reflect the new entry. When you've finished entering data in all the fields of the record, press Ins to transfer it to the database. If you compare the record to others in the database, you'll see that it is now a different color. If you have a monochrome screen, the record has a different intensity. This is because the macro now uses *input2* as the source location for {APPENDBELOW}. The cells in *input2* are still protected, and protection status remains intact when {APPENDBELOW} copies the source location to its target location. Similarly, if you wanted to retain the Currency 2 format for the *Payment* field of your records, you would assign that format to cell F14.

The addition of the new *entryarea* and *input2* ranges adjacent to your database allows you to observe the intermediate step of transferring data from the vertical orientation of *input* to the horizontal orientation required by {APPENDBELOW}. Obviously, you won't want to clutter a real data-entry screen this way. But if you plan to transfer information from a data-entry form like the one in figure 4 to a large database, a row of intermediate formulas hidden somewhere in the worksheet is usually your best bet. ■

Kelly Conatser is an assistant technical editor at LOTUS.

CUSTOM REPORTS FROM SYMPHONY

Now you can go beyond the simple row-and-column format that Symphony *sets up automatically.*

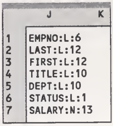
BY PAUL WILKERSON

Like *1-2-3*, *Symphony* combines a single-table database manager with a spreadsheet. *Symphony*'s database, however, has some important features not found in *1-2-3*. The most obvious is the data-entry screen you see while working in the FORM environment. Less apparent are *Symphony*'s report-generating features. With them you can produce listings, form letters, or mailing labels, and you can even print items from a database onto preprinted forms. In this article we'll explore the uses of *Symphony* report ranges, using a personnel database as an example.

Before creating a database, it's a good idea to set up a restricted window for Criterion ranges, tables, macros, and so forth. This way you can add or delete rows and columns—to allow for additional macro instructions, for example—without corrupting database-related ranges. Starting with a new worksheet, create a SHEET window and name it EXTRA: Press SERVICES, select Window Create, enter *extra*, press Return to select SHEET, and press Return again to accept the full-screen layout. Then select Restrict Range, specify range A1..I8192, and select Quit.

Notice that the name *EXTRA* appears at the lower-right corner of the window border. To return to the original window, MAIN, press the WINDOW key (F6 on most computers). The name *MAIN* now appears in the corner. Establish a restrict range for this window: Select SERVICES Window Settings Restrict Range, specify range J1..IV8192, and select Quit Quit. We now have two nonoverlapping windows, EXTRA and MAIN. We'll use the MAIN window for the database and the EXTRA window for some miscellaneous work.

Begin building the database by defining its structure. First make sure the MAIN window is current, then enter the labels exactly as they appear in the following screen:



```
    J            K
1  EMPNO:L:6
2  LAST:L:12
3  FIRST:L:12
4  TITLE:L:10
5  DEPT:L:10
6  STATUS:L:1
7  SALARY:N:13
```

These labels are field specifications. The first five characters in the label in cell J1 indicate that the first field will have the name *EMPNO* (for employee number). The letter L indicates that all entries in this field are labels. The number 6 indicates that the field has a length of 6 characters. The labels in range J2..J6 also indicate label fields of various lengths. The label in cell J7 indicates that the last field will have the name *SALARY*, will be a numeric field, and will have a length of 13 characters.

Now switch to the FORM environment by pressing the TYPE key (Alt-F10 on most computers) and selecting FORM. You see an empty FORM window with the message *No Definition range defined* in the control panel. Select MENU Generate and press Return twice to accept

DOUGLAS FRASER

the default field type and default field length. The prompt *Name for Database settings sheet* appears in the control panel. Type *employee* and press Return. *Symphony* displays the SHEET environment and prompts you for a range of field names. Specify range J1..J7. *Symphony* now displays the entry screen shown in figure 1.

Before going on, let's make a couple of changes that should improve the appearance of your reports. First return to the SHEET environment by pressing the SWITCH key (Alt-F9 on most computers). Since the only values that appear in the reports will be dollar amounts, we'll make sure that values are displayed with dollar signs. Select MENU Settings Format Currency, press Return to accept the default of two decimal places, and select Quit. To add some space between employee numbers and last names, set the width of column J to 7: With the cell pointer in column J, select MENU Width Set and enter 7. In the same manner, set the width of column O to 7. This allows you to see the field heading *STATUS* in its entirety.

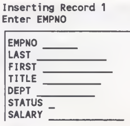
Next, we will make a minor modification to the data-entry system with the addition of a formula that causes *Symphony* to disallow any entry in the *STATUS* field except for the letters E, e, N, or n. In cell O23 enter the formula +K23="E"#OR#K23="N". This formula initially returns ERR. Then assign the General format to cell O23.

Now press the SWITCH key to change back to the FORM environment and enter the six records shown in the table below.

After entering the data for each record, press the Insert key to place that record in the database and create a new empty form.

CHART OF DATABASE ENTRIES

EMPNO	LAST	FIRST	TITLE	DEPT	STATUS	SALARY
856782	GIUSTO	MARIA	MANAGER	HR	E	45760
679345	JONES	REDD	SUPV	ACCTG	E	43670
423890	NGUYEN	PAUL	CLERK	RECEIVING	N	30500
987123	WILSON	MIKE	CLERK	SHIPPING	N	25600
023497	GALLAGHER	SHARON	ASST	HR	N	27800
573421	MONTEZ	ELLEN	MANAGER	ACCTG	E	48950



```
Inserting Record 1
Enter EMPNO

EMPNO  ______
LAST   ___________
FIRST  ___________
TITLE  __________
DEPT   __________
STATUS _
SALARY ____________
```

FIGURE 1

Symphony's Report Ranges

Let's examine the settings sheet you created when you generated the database, including its various ranges. Select MENU Settings and you'll see the screen shown in figure 2. This is the sheet you named when you generated the database. Its name, as shown in the lower right, is EMPLOYEE. You can create other named settings sheets to suit your needs. You'll see how in a moment.

The entries on the screen that begin with *EMPLOYEE_* are named ranges in the *Symphony* worksheet and were created automatically when you generated the database. Our concern now is with the report ranges. *EMPLOYEE_MA* is the name of the Main report range, which contains formulas that determine the content of the report. *EMPLOYEE_AB* is the name of the Above report range, which is the heading that will be printed at the beginning of the report. Note that the space next to the word *Below* is blank. The Below report range is printed at the end of the report and often contains formulas that give totals for numeric fields. *Symphony* does not create a Below report range automatically.

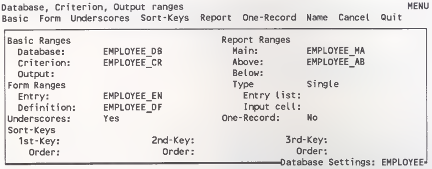
When *Symphony* prints a report, it first calculates any formulas in the Above range and prints that range. Then it copies the first record in the database, or the first record that matches the criteria in the Criterion range, to the Main range. Finally, it prints the Main range. *Symphony* repeats the second and third steps for each record in the database or for each record that conforms to the Criterion range. When all the records are printed, *Symphony* calculates any formulas in the Below range, if any exist, and prints them.

Select Quit to return to the FORM window, then press the SWITCH key to change to the worksheet window. The versatility of database reporting with *Symphony* comes from the fact that underneath the FORM environment is a spreadsheet. The Above and Main report ranges (and the Below report range, if you establish one) are named ranges in the spreadsheet. The Above range, *EMPLOYEE_AB*, has the coordinates J26..P26. As you can see, that range contains copies of the field names you entered earlier.

The Main range, *EMPLOYEE_MA*, has the coordinates J27..P27. Move the cell pointer to cell J27, and you see that it contains the formula +empno. The cell named *empno* is the first cell under the field name *EMPNO* in the Database range. Cell K27 contains the formula +last. Each cell in the Main report range contains a formula consisting of a plus sign and the name of its field. As *Symphony* prints a report, it adjusts the formulas in the Main range to refer to the record that is being printed.

The Main report range can contain labels, values, or formulas. However, it cannot contain formulas using the database statistical functions (@D functions) unless they refer to another database that you may have created in the same worksheet. Formulas that return database information that will appear in the report must refer to the first entry under a field name. By default, that cell has a range name that matches the name of the field. These references must be left relative. If a formula refers to a cell outside the database, the reference must be absolute. For example, if one element in a report is the salary value in the database multiplied by a value in cell F1, use the formula +salary*F1.

Cells in the Above and Below report



```
Database, Criterion, Output ranges                                        MENU
Basic  Form  Underscores  Sort-Keys  Report  One-Record  Name  Cancel  Quit
 Basic Ranges                             Report Ranges
   Database:        EMPLOYEE_DB             Main:          EMPLOYEE_MA
   Criterion:       EMPLOYEE_CR             Above:         EMPLOYEE_AB
   Output:                                  Below:
 Form Ranges                                Type           Single
   Entry:           EMPLOYEE_EN               Entry list:
   Definition:      EMPLOYEE_DF               Input cell:
 Underscores:       Yes                   One-Record:      No
 Sort-Keys
    1st-Key:                 2nd-Key:                   3rd-Key:
      Order:                   Order:                     Order:
                                             Database Settings: EMPLOYEE
```

FIGURE 2

ranges can include labels, values, or formulas, including ones that use database statistical functions. These ranges should not contain formulas that refer to cells in the database.

With the ranges *Symphony* has set up automatically, you can print a usable report that shows each record arranged in one row. Select SERVICES Print Settings Source Database, select Employee from the menu that appears, then select Quit Go Quit. The Above report range and then each record in the database appear on your printer.

You can enlarge the Above range or change its contents to improve the appearance of your report. Let's change it slightly by adding a row of dashes that will separate the report heading from the first record. Move the cell pointer to cell J27, and add a new row to the spreadsheet by selecting MENU Insert Rows and pressing Return. Enter a backslash and a hyphen in cell J27, and copy cell J27 to range K27..P27. Then redefine the Above range: Select MENU Range Name Create, highlight *EMPLOYEE_AB*, press DownArrow, then press Return. Now select SERVICES Print Go Quit. The printed report now has a dividing line under the report heading.

Multiple-Pass Reports

Simple listings, like the ones we've just printed, are fine for reference or record purposes. But *Symphony*'s report capabilities can work much harder for you. *Symphony* can produce multiple-pass reports, in which it prints the Above range, prints one copy of the Main range for each record that meets a certain criterion, prints the Below range, then prints the Above range again, prints a copy of the Main range for each record that meets a second criterion, prints the Below range again, and so on. This lets you create a report that has control or break points. To illustrate, we'll print the database, which we'll divide according to the status (exempt or nonexempt) of each employee. The report will show the number of employees in each group and the sum of the salaries in each group.

■

You can build a report range from scratch, positioning information from the database exactly where you want it.

■

The first step in creating this kind of report is to set up a new Criterion range. Do this instead of using *employee_cr*, the Criterion range that *Symphony* set up automatically. This way you avoid problems that would be caused if there were an entry in one of the other fields in *employee_cr*. Press the WINDOW key to switch to the EXTRA window. Enter *STATUS* in cell A1. Assign the name *status_cr* to range A1..A2: Select MENU Range Name Create, enter *status_cr*, and specify range A1..A2.

Status_cr will be used as the multiple-pass report's Criterion range. If you enter *n* in cell A2 and print a report, you'll get only those records with the letter N in the *STATUS* field. If you then enter *e* and print a report, you'll get only those records with the letter E in the *STATUS* field. If you then erase cell A2 and print a report, you'll get all records. When you print a multiple-pass report, *Symphony* performs all these steps automatically.

The next step is to create a list of entries for *Symphony* to place in the Criterion range. Enter *n* in cell A4 and enter *e* in cell A5. Assign the name *statuslist* to range A4..A6. If you include the empty cell in this range, the report will include a section containing all the records.

Press the WINDOW key to return to the MAIN window. We'll now add a Below range in which to calculate subtotals for each group. Move the cell pointer to cell J29 and add four rows to the spreadsheet by selecting MENU Insert Rows and pressing the DownArrow key three times. Then make the following entries:

Cell	**Entry**
J30	TOTAL NO. OF EMPLOYEES
M30	@DCOUNT(employee_db,0, status_cr)
O30	TOTAL
P30	@DSUM(employee_db,6, status_cr)

Assign the General format to cell M30. In cell J32 enter a split vertical bar followed by two colons (¦::). This will cause *Symphony* to send a page-feed command to the printer after each section of the report. Then assign the name *group_be* to range J29..P32.

Finally, create a new settings sheet for this report. Select MENU Query Settings Name Create and enter *group*. Select Basic Criterion, enter *status_cr*, and select Quit. Select Report Below and enter *group_be*. Select Type Multiple. When *Symphony* prompts you for an entry list, enter *statuslist*. *Symphony* then prompts you for an input cell. Specify cell A2, then select Quit Quit Quit.

To print the report, line up the paper in your printer, select SERVICES Print Settings Source Database, select Group, and select Quit Align Go Quit. The three records with the letter N in the *STATUS* field are printed on one page, the three

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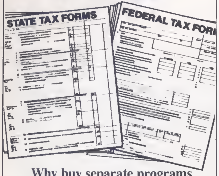

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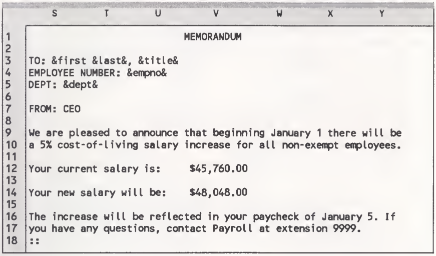


```
        S       T       U       V       W       X       Y
1                              MEMORANDUM
2
3   TO: &first &last&, &title&
4   EMPLOYEE NUMBER: &empno&
5   DEPT: &dept&
6
7   FROM: CEO
8
9   We are pleased to announce that beginning January 1 there will be
10  a 5% cost-of-living salary increase for all non-exempt employees.
11
12  Your current salary is:     $45,760.00
13
14  Your new salary will be:    $48,048.00
15
16  The increase will be reflected in your paycheck of January 5. If
17  you have any questions, contact Payroll at extension 9999.
18  ::
```

FIGURE 3

records with the letter E in the *STATUS* field are printed on the next page, and all six records are printed on a third page.

A Fancy Report

To end our discussion of *Symphony* database reports, we'll see how to create a report range from scratch, placing the fields on the page exactly where we want them. This technique is useful if you want to print information from a database onto preprinted forms. It takes time to set up such a report range properly, but you'll be helped by the fact that the positions of the entries on the worksheet screen roughly match the placement of the data on the printed sheet.

Although we won't go into preprinted reports in detail here, we'll demonstrate the concept of printing records in a full-page format by creating a memo to be sent to all nonexempt employees. We'll also see how database entries can be combined into longer strings and mixed with text.

First create a new Criterion range: Press the WINDOW key to display the EXTRA window, and enter *STATUS* in cell C1 and *n* in cell C2. Then assign the name *memo_cr* to range C1..C2. Press the WINDOW key again to display the MAIN window.

Set the width of column V to 12. Enter the labels shown in cell V1 and in range S3..S17 of figure 3. Enter a split vertical bar and two colons in cell S18. Then enter the following labels and formulas:

Cell	**Entry**
V12	+salary
V14	+salary*1.05

Assign the name *memo_ma* to range S1..Y18.

When *Symphony* prints the report, it replaces the text between the ampersands with values from the database. For example, the first record matching the criteria is that of Paul Nguyen, so in cell S3 *&first&* will be replaced by *PAUL*, *&last&* will be replaced by *NGUYEN*, and *&title&* will be replaced by *CLERK*.

Now create a new settings sheet. Select MENU Query Settings Name Create and enter *memo*. Select Basic Criterion, enter *memo_cr*, and select Quit. Select Cancel Report to remove the existing Above, Main, and Below report ranges and to reset the type of report to Single. Then select Report Main, enter *memo_ma*, and select Quit Quit Quit.

Finally, print the report. Line up the paper in the printer and select SERVICES Print Settings Source Database, select Memo and then Quit Align Go Quit. Your printer will produce three pages—one for each nonexempt employee in the database. ■

Paul Wilkerson is an electrical engineer for West Texas Utilities Co. in San Angelo, Tex.

CIRCLE 110 ON READER SERVICE CARD

DATABASE ADD-INS FOR 1-2-3

The help you need may be waiting in the database aftermarket.

BY RICH FRIEDMAN

There are close to a dozen add-in programs that expand the database features of *1-2-3* Releases 2.01 and 2.2. Although they differ in their memory requirements, in their ease of use, and in the features they add to *1-2-3*, many bring two main benefits to *1-2-3*'s database functions: relational operations and the ability to create disk-based databases.

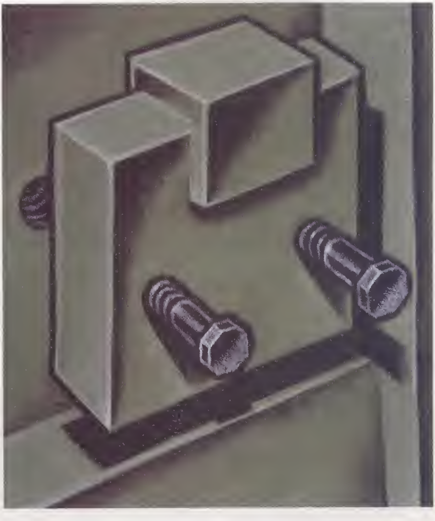
Relational databases let you link two or more tables. This lets you avoid having to duplicate data in multiple tables, and it can also give you some deeper insights into your data. Disk-based means that you can have much larger databases because you're not limited by the amount of available RAM nor by *1-2-3*'s limit of 8,192 rows.

Some database add-in programs are designed to help import and export data to specific mainframe and minicomputer database programs. Other add-ins are designed to ease the task of entering data into a *1-2-3* worksheet.

What follows is a short rundown of the more popular *1-2-3* database add-ins.

Silverado ($149, from Computer Associates International, 1240 McKay Dr., San Jose, CA 95131; 800-531-5236) lets you create a database of up to 32 million records and 512 fields, say its developers. However, the program creates a database file separate from your worksheet. You must export your *1-2-3* data to the new file before *Silverado* can use it.

Unlike *1-2-3* Releases 2.01 and 2.2, which can sort on only two database fields, *Silverado* can sort your database on as many fields as the database contains. You must pay a high memory price, however. *Silverado* requires 208K of RAM to run. For a review of *Silverado*, see the August 1988 issue, page 99.



@Base ($195, from Personics Corp., 63 Great Road, Maynard, MA 01754; 508-897-1575) requires only 72K of RAM, but it lets you build and view a relational disk-based database of up to 32 megabytes and 128 fields. You import *dBase* data files directly into a *1-2-3* worksheet. An easy-to-use menu lets you develop database queries, sort databases on any number of fields, and produce reports that are cross-tabulated. *@Base* brings 18 new @functions to *1-2-3*. For certain relational operations, such as joining records and indexing, you must purchase another program from Personics called *Option Pac* ($89.95). For a review of the *@Base* program, see the April 1988 issue, page 112.

DB12 III ($149, from Triple C Software, 2425 East Commercial Blvd., Suite 103, Fort Lauderdale, FL 33308; 305-772-8285) also lets you access a *dBase* file

DOUGLAS FRASER

while working in *1-2-3*. You can view a portion of a *dBase* file that has been imported into *1-2-3*, or you can perform operations on an entire *dBase* file with new @DB functions and then display the results in *1-2-3*. *DB12 III* (pronounced *dee bee one two three*) provides several ways to transfer data to and from *dBase* files. You can import data from *dBase* into a worksheet, export data from a worksheet into a new *dBase* database, or append *1-2-3* data to the end of an existing *dBase* database.

Depending on available RAM—the program takes up 110K—you can perform relational calculations across multiple database files. One @DB formula may reference up to 10 Criterion ranges. These ranges are combined into a single range for filtering records in your calculation. Of course, *DB12 III* does not have all of *dBase*'s relational-database or sophisticated reporting capabilities. But because *DB12 III* can be controlled by *1-2-3* macros, you can build custom applications that manipulate *dBase* files. For a review, see the January 1988 issue, page 133.

Deja! ($130, from PC Publishing, 1801 Avenue of the Stars, Suite 815, Los Angeles, CA 90067; 800-634-4555, in Canada 213-556-3630) also lets you import *dBase* data into *1-2-3*. You can manipulate or print the imported *dBase* data in the same way that you can manipulate the data in any *1-2-3* database. *Deja!* provides many @functions similar to *dBase* commands. You can append *1-2-3* worksheet data to the bottom of an existing *dBase* file, or you can create a new *dBase* file from your *1-2-3* worksheet data. However, if you import *dBase* data into your *1-2-3* spreadsheet and then change it, you cannot insert the modified spreadsheet data into the original *dBase* data. The syntax of a *Deja!* query resembles *dBase* syntax more than it resembles the syntax of *1-2-3*'s criterion formulas. For a review of *Deja!*, see the January 1988 issue, page 133.

Informix Datasheet Add-In ($145, from Informix Software, 4100 Bohannon Dr., Menlo Park, CA 94025; 415-926-6300) lets you share your database files with Informix database products running on your company's mini and mainframe computers. With *Datasheet* you use familiar *1-2-3* menus, commands, functions, and macros to interact with your data. *Datasheet* lets you manipulate and combine multiple database files from a *1-2-3* worksheet. You can also store index files containing unique sorts of your database. Be warned, however: Once you've attached the *Datasheet Add-In* to *1-2-3*, you'll have only about 90K of RAM left. For a review, see the February 1988 issue, page 112.

Oracle Database Add-In for Lotus 1-2-3, ($299, from Oracle Corp., 20 Davis Dr., Belmont, CA 94002; 800-672-2531) can help you move information between your PC and mainframes or other platforms running Oracle software. You can use *Oracle for 1-2-3* to query *Oracle* databases that reside on other PCs, networked PCs, minicomputers, or mainframes. You can even create a single query that retrieves data from more than one computer. *Oracle for 1-2-3* uses Structured Query Language (SQL), a command language that simplifies complex searches. The program streamlines sorting and querying operations by letting you use menus and prompts to write SQL statements.

■

With disk-based databases, you're not confined by available RAM or the row limit of 1-2-3.

■

However, compared with other database add-in programs, *Oracle for 1-2-3* offers little help in formatting reports, creating data-entry screens, or defining data-entry controls. It also consumes 271K of RAM. For a review, see the November 1988 issue, page 104.

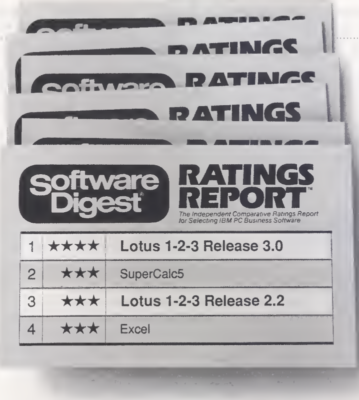
4Views ($149.95, from Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600) works directly with the *1-2-3* worksheet. Unlike the previously mentioned programs, it does not create a disk-based database. *4Views* derives its name from its ability to display data in four ways. It can show data as a table, just as it appears in a worksheet. It can display data in a one-record-per-screen format, which is helpful for entering and updating data. It can show a summary of your data as a cross tabulation, and it can show your data in a report format, as it would be printed. *4Views* requires 90K of RAM. For a review, see the August 1988 issue, page 99.

D.A.V.E. ($99.95, from Goldata Computer Services, 2 Bryn Mawr Ave., Bryn Mawr, PA 19010; 800-432-3267) is an add-in that is specifically designed to help get data into *1-2-3*. It makes data entry simpler and, in some cases, more reliable. *D.A.V.E.* comes with several easily customized templates for some common applications. There are templates for accounts payable and receivable, payroll, purchase-order tracking, inventory management, and budget and sales analyses. You can also use the program to print mailing labels and form letters from your database.

The program lets you design input screens with lines, borders, boxes, descriptive labels, prompts, and help messages—all in color. And to help insure the accuracy of the data, you can specify that the data you enter in any field match specific criteria. For example, a numeric Social Security field will not accept letters. *D.A.V.E.* needs 64K of RAM. For a review, see the August 1988 issue, page 99.

Data Manager ($79, from Intex Solutions, 161 Highland Ave., Needham, MA 02194; 617-449-6222) also speeds up and simplifies the data-entry task. Once you create a data-entry screen with fields, borders, and underlines, *Data Manager* checks to see whether data complies with preset criteria. You can specify various validation criteria, such as "numeric," "text," "within a range," or "appears in a table."

XYZ:Query ($145, from Intex Solutions) is a stand-alone program that reads worksheet files produced with *1-2-3* and *Symphony*. It can query databases residing on as many as 1,000 separate worksheets, produce list-style reports, and generate simple statistical summaries. If you need to retrieve information from multiple worksheets, *XYZ:Query* will save you time. ■



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Q&A

ANSWERS TO YOUR QUESTIONS ABOUT LOTUS PRODUCTS

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ANOTHER PROBLEM UNDERLINING CHARACTERS

Q. The underlining technique in the March issue didn't work for me. I entered the label L◀_O◀_T◀_U◀_S◀_, and it printed as L_O_T_U_S.

Why did this happen? I'm using *1-2-3* Release 2.01 and an IBM Quietwriter III printer.

Richard Robilotto
KeyCorp
Albany, N.Y.

A. What driver are you using for your printer? An IBM Quietwriter is listed on the Install menus of *1-2-3* Releases 2.01 and 2.2. If the driver you use isn't designed specifically for your printer, the merge character may have no effect. Even some of the printers for which drivers exist can't respond to a backspace instruction from the computer.

SKIP ROWS IN PRINT RANGE

Q. In the April issue you explained how to hide columns so that two nonadjacent columns could appear side by side in a printout. I'd like to know how to eliminate rows from a Print range. For example, can I print range A1..H100, eliminating range A20..H60, so that the resulting printout connects seamlessly? Can I hide rows in *1-2-3* as I hide columns?

Gale H. Owen
Regional Learning Service of Central New York
Syracuse, N.Y.

A. No, you can't hide rows in *1-2-3*. You can, however, print several ranges so that they appear on the printout seamlessly.

To print range A1..H100, omitting range A20..H60, select /Print Printer Range and indicate range A1..H19. Select Align Go, then select Range, indicate range A61..H100, and select Go a second time. Do not select Align, Line, or Page after printing the first range.

In *Symphony* the same rules apply. You select Services Print Settings Source Range, assign the first range to print, then select Quit Align Go. Select Settings Source Range again, indicate the second range to print, and select Quit Go without selecting Align, Line-Advance, or Page-Advance.

If by printing seamlessly you mean that you wish to eliminate page breaks, headers, and footers from the printout, select /Print Printer Options Other Unformatted in *1-2-3*, or SERVICES Print Settings Page Breaks No in *Symphony*.

Another way to eliminate rows from the Print range is to insert an extra column to the immediate left of the range you wish to print. In this case, you'd move the cell pointer to column A, select /Worksheet Insert Column (in *Symphony*, MENU Insert Columns), and press Return. Set the width of the new column A to 1. Select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) and enter 1.

Move the cell pointer to column A of the first row that you wish to omit from the printout. Type two split vertical bars (¦¦) and press Return. Only one vertical bar will appear in the cell—the other bar serves as the entry's label-prefix character. Next, copy the split vertical bars to column A of any other row you wish to omit from the printout. When you use the Print menus to assign the Print range, include column A as the leftmost column of the range. None of the rows that contain the vertical bar will be printed.

The advantage of the second technique is apparent when you wish to omit many nonadjacent rows from the printout. Rather than reassign the Print range several times, simply mark the rows that you wish to omit and assign the Print range once.

PRINT IN COLOR WITH AN EX-1000 COLOR KIT

In the April issue you stated that the Epson EX-100 printer with the Epson EX-1000 Color Option Kit would not print text in color in *1-2-3* or *Symphony*. This is incorrect. There is no easy way to print individual cells in color, but it can print each row in a different color—up to seven colors.

Make sure that you're using the text printer driver for Epson FX, RX, and JX Series printers. Then enter the characters ¦¦\027\114\xxx into the leftmost column of the Print range, preceding the line whose color you wish to change. Substitute one of the codes from the following list for the xxx in the setup string, depending on the color you wish to print:

Code	Color	Code	Color
000	Black	004	Yellow
001	Red	005	Orange
002	Blue	006	Green
003	Violet		

One occurrence of a setup string in the Print range changes the print color until the next occurrence of a string.

G Michael Bewley
ATR Wire & Cable Co.
Danville, Ky.

The editor comments: *Thanks to all the readers whose colorful letters corroborate the validity of G. Michael Bewley's approach.*

1-2-3/SYMPHONY

ANOTHER WAY TO CONVERT FORMULAS TO VALUES

Q. Is there a way to convert formulas to their resulting values other than to press EDIT CALC Return?

Dennis M Sharp
Moore, Okla.

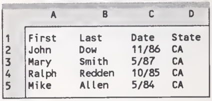
A. You can convert a range of formulas to values by using the Range Value (in *Symphony*, Range Values) command. Move the cell pointer to the upper-left corner of the range that contains the formulas. Select /Range Value (in *Symphony*, MENU Range Values). Specify the range of formulas as the range to copy from, and if you want to replace the formulas with their results, specify the same range as the range to copy to. If you want the results to appear somewhere else on the worksheet, specify that range as the range to copy to.

If you're using *1-2-3* Release 1A, use the File Xtract command to convert formulas to values. Move the cell pointer to the upper-left corner of the range that contains the formulas you wish to convert. Select /File Xtract Values (in *Symphony*, SERVICES File Xtract Values), enter a file name such as TEMP, then indicate the range. This procedure stores on disk copies of the range's current values.

Now, without moving the cell pointer, select /File Combine Copy Entire-File (in *Symphony*, SERVICES File Combine Copy Entire-File [Ignore or Read] Values), and indicate the file you just created (TEMP, in our example). The values from the temporary file on disk replace the formulas in the worksheet.

SORT BY YEAR AND MONTH

Q. I have a database that is similar to the one shown in the illustration:



	A	B	C	D
1	First	Last	Date	State
2	John	Dow	11/86	CA
3	Mary	Smith	5/87	CA
4	Ralph	Redden	10/85	CA
5	Mike	Allen	5/84	CA

I'd like to sort the database by using the year in the *Date* field as the primary sort key and the month in that field as the secondary sort key. Is there a way to do this?

Tom Gates
ICI Pharmaceuticals Group
Pasadena, Calif.

A. Because you entered the dates as labels, you'll have to go through some extra steps before you can sort them. In the future, use @DATE or @DATEVALUE functions whenever you enter dates. If the entries in column C were date serial numbers, they would be sorted in the order you desire. If you had entered the date labels to conform to one of the five valid date formats, you could use the @DATEVALUE function.

You'll need to work in two blank columns of your worksheet. Select two that are side by side. We'll use columns E and F for this discussion.

In cell E2 enter the formula @VALUE(@RIGHT(C2,2)). In cell F2 enter the formula @VALUE(@LEFT(C2,@FIND("/",C2,0))). Copy these formulas down the columns as far as needed. In this case, select /Copy (in *Symphony*, MENU Copy), indicate range E2..F2 as the From range, and indicate range E3..E5 as the To range.

You could now sort the database by extending it to include the new columns. Then you could indicate column E as the first sort key and column F as the second. However, as long as we're doing this much work, let's keep going and convert the new columns of data into date serial numbers.

Start by converting the new formulas into values: Select /Range Value (in *Symphony*, MENU Range Values), indicate range E2..F5 as the From range, and indicate cell E2 as the To range.

Now replace the entry in cell C2 with the formula @DATE(E2,F2,1). Copy the formula to range C3..C5. Next, use the Range Value (in *Symphony*, Range Values) command to convert the resulting formulas to values. Select /Range Format Date 3 (in *Symphony*, MENU Format Date 3) and indicate range C2..C5 as the range to format.

Finally, erase the entries from columns E and F. Now you can sort the database, using column C as the primary sort key. The entries will be sorted first by year, then by the months within each year.

THE SPREADSHEET'S ROOTS

Q. Can a *1-2-3* or *Symphony* spreadsheet determine the cube root (or any root) of a number?

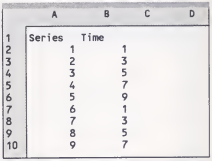
Pat Spohn
ITT Lester Industries
Solon, Ohio

A. Yes, it can. One way that you can represent the cube root of a number is to show the number raised to the reciprocal of 3—for example, X^(1/3). Likewise, the positive fourth root of X is equivalent to X^(1/4), the positive fifth root is X^(1/5), and so on. So to calculate the positive eighth root of 6,561, for example, enter the formula 6561^(1/8). The answer is 3, incidentally.

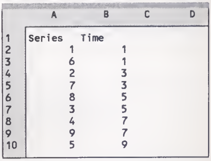
To find the positive square root of a number, use the @SQRT function. The formula @SQRT(9) returns the positive square root of 9, which is 3.

ARBITRARY SORT ORDER

Q. When I sort data in large spreadsheets, *Symphony* doesn't retain the relative order of records within groups of records that equal each other in the *Time* column (see the first figure below). For example, the two figures below show a database before and after it was sorted in ascending order using column B as the first sort key:



	A	B	C	D
1	Series	Time		
2	1	1		
3	2	3		
4	3	5		
5	4	7		
6	5	9		
7	6	1		
8	7	3		
9	8	5		
10	9	7		



	A	B	C	D
1	Series	Time		
2	1	1		
3	6	1		
4	2	3		
5	7	3		
6	8	5		
7	3	5		
8	4	7		
9	9	7		
10	5	9		

Before sorting, the record with 3 in the *Series* field and 5 in the *Time* field precedes the record with 8 and 5 in the corresponding fields. However, after sorting, the record with 3 and 5 ends up following the record with 8 and 5. It seems you can never predict how *Symphony* will break ties of this type, but it would be nice to have the original order preserved within groups of tied records. How can I get the results I want?

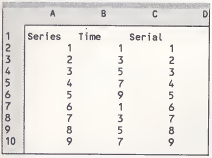
Kurt Schrader
San Antonio, Tex.

A. You cannot predict the order of sorted records when you let *1-2-3* Releases 2.01 or 2.2 or *Symphony* decide for you. Because you have set only one sort key, *Symphony* must decide for itself how to break ties. That decision is arbitrary.

You can specify additional sort keys (a total of 2 sort keys in *1-2-3* Releases 2.01

and 2.2, 255 sort keys in *1-2-3* Release 3, and 3 sort keys in *Symphony*) to break ties. In this example, you can maintain the original order of the *Series* column by specifying column A as the second sort key.

Although the *Serial* column, column C, matches your original *Series* column, this may not always be the case. You can preserve the original order within tied groups by adding an extra column to a database. Fill the extra column with a sequence of ascending values, then assign the column as the second sort key before you sort the database. For example, the following illustration shows your original database with an added column of serial numbers:



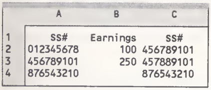
	A	B	C	D
1	Series	Time	Serial	
2	1	1	1	
3	2	3	2	
4	3	5	3	
5	4	7	4	
6	5	9	5	
7	6	1	6	
8	7	3	7	
9	8	5	8	
10	9	7	9	

The *Serial* column should always contain an ascending sequence like the one shown, no matter what the other columns contain.

Reassign the Database range to include the new column, then assign column C as the second sort key and specify ascending order. When you sort the database, *Symphony* will organize groups of tied records based on the values in column C. As the lower value comes first in your example, this scheme will preserve that order of the subgroup's records.

FIND THE ONES THAT MATCH

Q. I have combined portions of two files to create a third file that contains three columns, as shown below:



	A	B	C
1	SS#	Earnings	SS#
2	012345678	100	456789101
3	456789101	250	457889101
4	876543210		876543210

Some of the Social Security numbers in column A have matches in column C. However, there may be numbers in either column that do not have matches in the other. I need to copy values from column B to column D for any Social Security number in column C that matches one in column A. Unfortunately, Social Security numbers that match don't always fall in the same row.

I've tried the @VLOOKUP function, but it returns a near match when it can't find an exact one. Only exact matches will do. How can I make this work?

Cameron F Hutt
State Mutual Companies
Worcester, Mass

A. The @VLOOKUP function ought to work in all cases, depending upon how you use it. The @VLOOKUP function approximates its evaluation only when it's looking up a numeric value. It must find an exact match when it looks up a label, or it will return ERR.

Your example shows one Social Security number that begins with a zero. This isn't possible in a Lotus spreadsheet unless the entry begins with a label-prefix character. In fact, because Social Security numbers can begin with zeros, you should store them as labels.

If the Social Security numbers in columns A and C are labels rather than values, you can enter the following formula into cell D2 and copy it down the column as needed:

```
@IF(@ISERR(@VLOOKUP(C2,
   $A$2..$C$4,1)),0,
   @VLOOKUP(C2,$A$2..$C$4,1))
```

When you use the formula in your own worksheet, make sure that the second cell address in each of the range references coincides with the last cell that contains data in column C. For Social Security numbers in column C that match entries in column A, the formula copies a corresponding value from column A. For any other Social Security numbers in column C, or when the value in column B equals 0, the formula returns 0.

PRINT COLUMN HEADINGS

Q. How can I print column headings on each page of output? I use the Headers option to print the current date and page number, but I'd like to carry column headers over from one page to the next.

Richard Kluchar
Chagrin Falls, Ohio

A. Select /Print Printer Options Borders Rows (in *Symphony*, SERVICES Print Settings Other Top-Labels), and indicate the range of cells that you want to appear at the top of each page. The range you indicate will appear after the header and before the regular text on each page. Make sure that you don't specify the border cells as part of the Print range or your border will print twice.

Select /Print Printer Options Borders Columns (in *Symphony*, SERVICES Print Settings Other Left-Labels) to specify a range of cells that you want to print to the left of the Print range. Select /Print Printer Clear Borders (in *Symphony*, SERVICES Print Settings Other No-Labels) to clear the borders.

1-2-3 and *Symphony* print fewer lines of the main text on each page to make room for the print border.

RANGES DON'T EXPAND

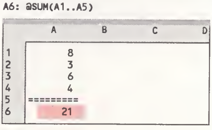
Q. I use @SUM and @COUNT formulas at the bottom of ranges. When I insert a row at the end or just above the data, the references in the @SUM and @COUNT formulas don't adjust to allow for the new row. When I insert the row somewhere within the range, the formulas adjust properly. Am I doing something wrong, or is there a way to circumvent this problem?

David W Forsman
Central Convalescent
Yakima, Wash

A. Your software behaves exactly as its documentation predicts it will. When you insert a row, the row that you specify moves down in the worksheet and the new row falls directly above it. Everything above the new row remains as it was.

Consider the formula @SUM(A1..A5) in the following example. If you insert a row at row 6, row 5 remains where it started. The formula @SUM(A1..A5) remains unchanged. Likewise, if you insert a row at row 1, the original row 1 and everything below it moves down one row in the worksheet. Row 1 becomes the new row 2, so the resulting formula reads @SUM(A2..A6).

If you wish to expand a formulaic range reference by inserting a row in the worksheet, you must insert the row be-



```
A6: @SUM(A1..A5)
```

	A	B	C	D
1	8			
2	3			
3	6			
4	4			
5	=========			
6	21			

neath the range's first row but no lower than the range's last row. With some @functions, you can use dividing lines to design your spreadsheets so that they allow the row insertions without disrupting the order of your data.

In our example, the @SUM formula includes cell A5 in its range reference. Should you wish to insert a row at row 5 so that you can enter more data in the column, the @SUM formula's reference will expand to include the new row.

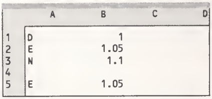
The label in cell A5 does affect the result of all statistical @functions except @SUM. Use the technique of inserting rows with dividing lines judiciously, or your spreadsheet may return meaningless results.

LETTERS AS VALUES

Q. I'd like to be able to enter one of several letters in a cell and have the letter represent a value that formulas could use in calculations. For example, the letter D would represent 1, the letter E would represent 1.05, and the letter N would represent 1.1. Is there some way a formula can know what value to use based on the letter it finds in a cell?

Donald McKague
Teeswater, Ontario

A. The easiest way to do this requires several cells. First, create a lookup table that contains in the left column the letters you wish to use in the data-entry cell. In the right column enter values that correspond to the letters. The table of letters and values you suggest appears in range A1..B3 of the worksheet below:



	A	B	C	D
1	D	1		
2	E	1.05		
3	N	1.1		
4				
5	E	1.05		

For this example, enter the letter E in cell A5 so that you can see the formula work as you create it. In the adjacent cell enter @VLOOKUP(A5,A1..B3,1). The function's first argument refers to the letter-entry cell. The function's second argument refers to the table of valid letters and their corresponding values. The third argument is the column offset. The @VLOOKUP function counts one column to the right from the first column of the table and returns the value that resides in the corresponding cell.

When you enter the formula, it returns the value 1.05. When you wish to alter the function's value, simply enter a different letter from the table of letters and corresponding values into the appropriate cell—A5 in our example. Remember that the @VLOOKUP function is case-sensitive, and if you enter a letter that's not included in the table, the formula will evaluate to ERR.

1-2-3

RANGE-NAME MORASS

Q. I have a worksheet that contains 850 range names. When I extract a range from the file, the resulting file contains all 850 names, even though the names have no use in the new file. The extracted files are unnecessarily large. How can I extract files but leave the range names behind?

Mike Bruce
Jefferson City, Mo

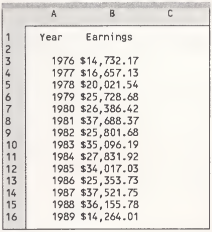
A. You can't leave range names behind when you extract a range from a worksheet in *1-2-3*. You can, however, retrieve the extracted file, delete all the names in one fell swoop, then resave the file. To use less memory, retrieve the file again.

To delete the range names, select /Range Name Reset.

CONTEST

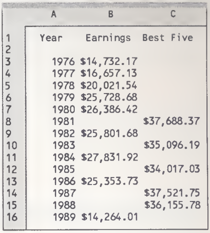
NEW CONTEST

This month we ask users of *1-2-3* Releases 2/2.01, 2.2, and 3, and *Symphony* to submit the best method for finding the top five years of earnings in column B and moving them into the appropriate rows in column C, as shown in the two figures:



	A	B	C
1	Year	Earnings	
2			
3	1976	$14,732.17	
4	1977	$16,657.13	
5	1978	$20,021.54	
6	1979	$25,728.68	
7	1980	$26,386.42	
8	1981	$37,688.37	
9	1982	$25,801.68	
10	1983	$35,096.19	
11	1984	$27,831.92	
12	1985	$34,017.03	
13	1986	$25,353.73	
14	1987	$37,521.75	
15	1988	$36,155.78	
16	1989	$14,264.01	

BEFORE



	A	B	C
1	Year	Earnings	Best Five
2			
3	1976	$14,732.17	
4	1977	$16,657.13	
5	1978	$20,021.54	
6	1979	$25,728.68	
7	1980	$26,386.42	
8	1981		$37,688.37
9	1982	$25,801.68	
10	1983		$35,096.19
11	1984	$27,831.92	
12	1985		$34,017.03
13	1986	$25,353.73	
14	1987		$37,521.75
15	1988		$36,155.78
16	1989	$14,264.01	

AFTER

Your method shouldn't use any sorting techniques, and the chronological order must be maintained.

This contest idea was submitted by Patrick A. Thomas of Shillington, Pa.

The first 25 people who submit entries that the *LOTUS* judges consider the best answer will receive a Lotus flight bag. Please send your answer on a nonreturnable disk along with a printout of your contest entry, documented with appropriate comments. All entries must be postmarked before midnight, December 31, 1989. Winners will be announced in the March 1990 issue. Send your answers to **December Contest**, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

Submit contest ideas to Q&A Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Include your solution, documented with appropriate comments. We'll pay $200 if we use your contest idea accompanied by a proven solution, $25 if we use your idea unaccompanied by a solution.

This material was prepared by Daniel Gasteiger and the Technical Editors

WRITE US

Do you have a question? We can't answer every letter, but if yours is selected, we'll publish it along with an answer or a request to other readers for advice. We'll pay $25 for each letter we publish. Send your letters, including your address and daytime phone number, to. Q&A, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

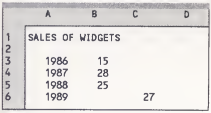
GOOD IDEAS

READER TIPS ON USING LOTUS PRODUCTS

1-2-3/SYMPHONY

CHANGING COLOR OF BAR-GRAPH DATA

I recently found a way to change bar colors and hatch patterns in a *1-2-3* graph by using a single series of data. This technique is especially useful when graphing this year's and last year's sales figures on the same graph. I usually want the two bars to have different hatch patterns, and I want all bars to be centered over the X-axis tick marks.



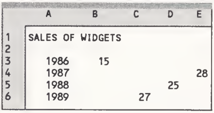
	A	B	C	D
1	SALES OF WIDGETS			
2				
3	1986	15		
4	1987	28		
5	1988	25		
6	1989		27	

To see how my technique works, enter the data as shown in the figure above. Press slash and select Graph Type Stacked-Bar (in *Symphony*, press MENU and select Graph 1st-Settings Type Stacked-Bar, then select Range) and specify the ranges as follows:

Graph Range	**Range Address**
X	A3..A6
B	B3..B6
F	C3..C6

Select View (in *Symphony*, Quit Quit Preview), and you'll see a graph that has three bars that have the same hatch pattern or color and a fourth bar that has a different pattern or color.

You can also set up your data and graph ranges in a way that lets you create up to six patterns or colors for each range of the stacked bar. For example, enter the data as shown in the following figure and define the graph ranges as follows:



	A	B	C	D	E
1	SALES OF WIDGETS				
2					
3	1986	15			
4	1987				28
5	1988			25	
6	1989		27		

Select View (in *Symphony*, Quit Quit Preview), and the program will display a graph that has four patterns or four colors. This technique works with only one series of data.

Graph Range	**Range Address**
X	A3..A6
B	B3..B6
C	C3..C6
E	D3..D6
F	E3..E6

Jill Barnhart
Owego, N.Y.

USE POINT MODE TO BROWSE AROUND

Here is a nonmacro technique that lets you use Point mode to browse around a worksheet and then return to the starting location.

To see how it works, in Ready mode in *1-2-3* or *Symphony*, press the plus key or the minus key to change to Value mode. When you use a cursor-movement key, *1-2-3* or *Symphony* automatically shifts into Point mode, allowing you to move around and view any part of the spreadsheet. When you're finished browsing, press the Escape key twice—once to return the pointer to its starting location and once to remove the plus or minus sign from the control panel. This technique is especially useful when you have a large worksheet.

Tom Miller
MicroProse Computing
Phoenix, Ariz

If you press Return before pressing the Escape key twice, you can inadvertently write over the current cell's contents. A safer way to browse in Point mode is to press the GOTO key and then use the cursor-movement keys to move about freely. Press the Escape key to return the cell pointer to your starting location. With this method, if you do press the Return key accidentally while browsing in Point mode, 1-2-3 *or* Symphony *moves the cell pointer to the new location. You won't lose any information.*

ELEMENTARY AUDITING TOOL

Sometimes I need to find all the cells in a worksheet that depend on a specific cell. To do so, I place the cell pointer on that cell (for example, cell C5), press the EDIT key, then enter /0. Since any value divided by zero evaluates to ERR, this cell and any cells that reference it will return ERR without corrupting their formulas. If Recalculation is set to Manual, then press the CALC key. Every formula that depends on cell C5 will evaluate to ERR.

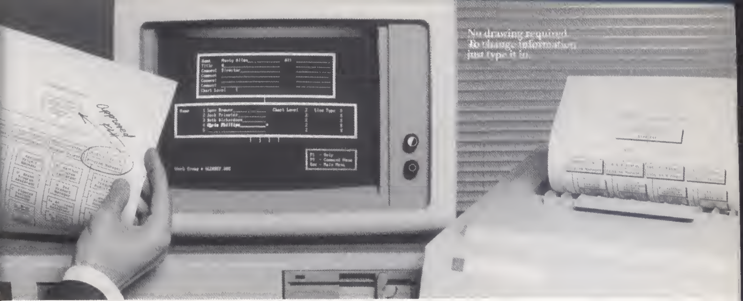
When you're done, erase /0. If Recalculation is set to Manual, press the CALC key to update all dependent cells.

This is not a substitute for a good auditing package, but it does serve to identify both direct and indirect dependencies of a particular cell, assuming you don't have any previous ERRs on your worksheet.

Jeff Glassman
Cambridge, Mass

DRIVER-FILE ERROR

When I tried to add new device drivers by using the *1-2-3* Release 2.01 Install program, I received the error message *Error reading a driver file.* I



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To find and correct the problem, follow these steps:

1. Exit the Install Program.
2. In DOS, with the *1-2-3* program directory current, enter the following DOS DIR command in order to display all the driver files in that directory:

```
dir *.drv
```

3. If the directory lists only the driver files that you are adding, one or more of these files may be damaged. Try recopying the driver files from the original disk to the directory and rerunning the Install procedure. If you still get the error message, you may have a damaged driver disk. Check the disk by using the DOS CHKDSK command. If this check indicates that there are bad sectors on the disk, you will need to ask the manufacturer to replace the disk.
4. If the directory contains additional driver files that you don't intend to use with *1-2-3*, follow one of two procedures. You can move the non–*1-2-3* drivers from the *1-2-3* directory to another directory and rerun the Install program to add the new device drivers. Or you can use the DOS RENAME command to temporarily rename the driver files that you don't need so that they no longer have the .DRV file extension. Rerun the Install program to add the new drivers. Then rename the driver files, giving them their original names.

Jade Dornfeld
Topanga, Calif.

This problem also occurs in Symphony *Releases 1.1, 1.2, and 2.0.*

FIXING REGRESSION ERROR

When I tried to use data regression in *1-2-3*, I received the error message *More than 16 X variables*. I defined my X range as range B3..T3 and the Y range as range B4..T4.

I found that *1-2-3* requires you to enter the X range and the Y range in their own columns. *1-2-3* Release 2.01 can handle up to 16 X variables, and the Y range should contain the same number of rows as the X range.

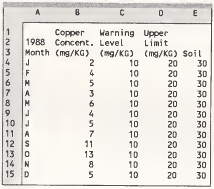
To correct the problem, I used the Range Transpose command to move the values from row to column and respecified the ranges in the Data Regression command.

Paul Roth
Winchester, Mass.

This also happens in Symphony. 1-2-3 *Release 3 can have up to 75 X variables.*

ADVANCED USE OF DATA LABELS

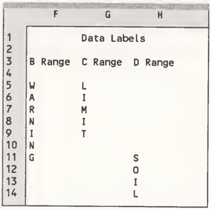
I've found some creative uses for data labels within my graphs. The following figure shows the entries I use to create a graph of pollutant levels. Only columns A and B contain real data. I created the warning and limit lines by inserting three extra columns of artificial data.



	A	B	C	D	E
1		Copper	Warning	Upper	
2	1988	Concent.	Level	Limit	
3	Month	(mg/KG)	(mg/KG)	(mg/KG)	Soil
4	J	2	10	20	30
5	F	4	10	20	30
6	M	5	10	20	30
7	A	3	10	20	30
8	M	6	10	20	30
9	J	4	10	20	30
10	J	5	10	20	30
11	A	7	10	20	30
12	S	11	10	20	30
13	O	13	10	20	30
14	N	8	10	20	30
15	D	5	10	20	30

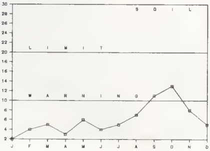
Specify the ranges as follows:

Graph range	**Range**	**Data labels**
X range	A4..A15	
A range	B4..B15	
B range	C4..C15	F4..F14 (Above)
C range	D4..D15	G4..G14 (Above)
D range	E4..E15	H4..H14 (Below)



	F	G	H
1		Data Labels	
2			
3	B Range	C Range	D Range
4			
5	W	L	
6	A	I	
7	R	M	
8	N	I	
9	I	T	
10	N		
11	G		S
12			O
13			I
14			L

Format the A range to display both lines and symbols and the B and C ranges to display lines only. Format the D range to display neither symbols nor lines. This causes only the data label itself to appear.



Patrick J. Cassidy
B&V Waste Science and Technology Corp
Overland Park, Kans

SYMPHONY

SETTINGS-SHEET CAVEAT

I'd like to share a solution to a problem I had using Query commands. After I generate a database in *Symphony* Release 1.2, I usually create two Database settings sheets, Form and Sheet. I attach Form while in the FORM window. When I switch back to SHEET, I select MENU Query Settings Name Use to make the Sheet settings sheet current. If I then use any Query command and switch back to FORM, I find that the Form settings sheet is still attached to the FORM window, as it should be. However, when I switch back to the SHEET window, the Form settings sheet is now attached to the SHEET window.

To correct this problem, remember to switch back to the Sheet settings sheet before you do any Query command.

Timothy Petit
Providence, R I

This problem also occurs in Symphony *Releases 1.1 and 2.0.*

ACTIVE WINDOW SETS PRINT COLUMN WIDTHS

I wanted to print ranges that have different column widths on a large spreadsheet. I selected SERVICES Window Settings Restrict Range before setting different column widths in different windows. The windows allowed me to have ranges with different column widths. For example, I wanted to print range A1..B20 where column A has a width of 20 for range A1..B10 and a width of 6 for range A11..B20.

I created a macro to print each range with its own column widths and other settings. However, each range printed at the default column-width setting. The print macro specified the range but not the relevant window, so *Symphony* used the MAIN window for all the Print ranges. To solve the problem, I inserted into my macro the command SERVICES Window Use, followed by the name of the appropriate window. I inserted it before the command that defines each Print range.

Donald L. Gilsdorf
Evansville, Ind

DOS

EFFECTIVE USE OF DOS PATH STATEMENT

You can save yourself several keystrokes with proper use of the DOS PATH statement in an AUTOEXEC.BAT file and in other batch files. You'll almost never have to use a DOS CD (change directory) command.

If you create batch files to run your applications and you store these batch files in the root directory, a PATH statement in your AUTOEXEC.BAT file, such as the one below, allows you to use all of the DOS commands stored in your DOS subdirectory without first having to make the DOS subdirectory current:

```
path=c:\dos;c:\
```

Such a PATH statement also lets you run your batch files without first having to change directories. For example, using the DOS COPY CON command, I created the following batch file, called 1.BAT, to run *1-2-3*:

```
cd\lotus
123
cd\
```

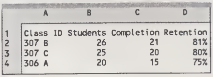
LOTUS is the name of the subdirectory where I store the *1-2-3* program files. The batch file contains a CD command both to start the program and to change the default directory back to the root directory after I exit the program. Since I store batch files such as these in the root directory, my DOS PATH statement works so that I never have to enter a CD command manually in order to run an application. For example, to load *1-2-3*, I enter the number 1 at the C> prompt.

Paul W. Lycett
Georgia Dept. of Community Affairs
Atlanta, Ga

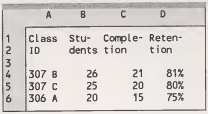
REVISITED

TRICKS FOR A MORE READABLE DATABASE

I'd like to share an additional use for Daniel Morgan's technique [January] of using the Range Format Hide command to print a row of double underlines below field names. When the width of data in a column is much narrower than the field name, you can adapt this same technique to display or print the field name in two short lines instead of one long line. Thus, if you have a database that looks like the one in the first figure, you can change the column widths so that they are like those in the second figure.



```
     A        B         C          D
1  Class ID Students Completion Retention
2  307 B         26         21        81%
3  307 C         25         20        80%
4  306 A         20         15        75%
```



```
     A      B       C       D
1  Class   Stu-    Comple- Reten-
2  ID      dents   tion    tion
3
4  307 B     26       21    81%
5  307 C     25       20    80%
6  306 A     20       15    75%
```

Here, I inserted two rows above the row of field names and reentered the labels in the two inserted rows. Then I used the Range Format Hide command to hide range A3..D3. Now, if you want to issue Data Query commands, do so by copying the hidden labels in range A3..D3 to the Criterion and Output ranges. Use the Range Format Reset command to display the labels in those ranges again.

Ordinarily, having two field names with the suffix *tion* would cause the Data Query commands to produce incorrect results. But in this case you won't be using that second row of labels as your field names. The field names that are used by the Data Query commands are in row 3. Specify the Input range as range A3..D6.

By using this technique, I was able to add 10 more columns of data to the printed page.

Mike Firth
Dallas, Tex.

FIXING A PAGE-BREAK PROBLEM ON EPSON LQ-1050

I had the same problem with the Epson LQ-1050 printer that was mentioned in Good Ideas in April. The "short tear-off" feature didn't work with *1-2-3*.

I solved the problem by installing a printer driver for the IBM Proprinter and using the Worksheet Global Default Printer Name command to select the IBM printer driver instead of the Epson.

Claiborne W. Gooch
Easton, Md.

UPDATING CELLS WITH RELATIVE FORMULAS

I'd like to add an alternative to John W. Brown's technique in the March issue. He entered the current month and year as a label in cell A1 and used the formula +A1 to display the date in other cells in the worksheet.

Another way to enter the current date is to use the @NOW function in all releases of *Symphony* and *1-2-3*—except *1-2-3* Release 1A, in which you use the @TODAY function. Then format the cell using the Date 3 (MMM-YY) format to display the month and year. By using the @NOW or @TODAY function instead of the date label, you force *1-2-3* and *Symphony* to automatically update the date when you next retrieve the worksheet.

Sandra F. Anjard
Lancaster, Pa

This material was prepared by Subhadra Mattai and the Technical Editors, with the help of the Lotus Product Support staff.

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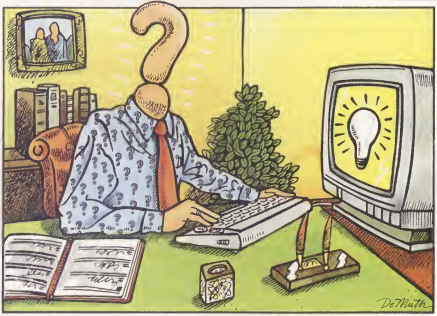
IDEAS BY THE SCREENFUL

IdeaFisher and *Idea Generator Plus* stimulate creative thinking.

BY BRYAN MATTIMORE



Two programs, *IdeaFisher* and *Idea Generator Plus*, turn your computer into an instrument with which you can generate ideas that help you solve business problems.

Oddly enough, it would be more appropriate for each program to bear the other's name. *IdeaFisher* helps you generate ideas. The program asks you questions about your problem, and then churns out volumes of relevant ideas by associating your answers with some of the 60,000 words and phrases in its database of ideas. In contrast, *Idea Generator Plus* makes you fish for ideas undiscovered in your own brain. It also asks you questions about your problem. But instead of turning those answers into ideas, it uses each answer to formulate a more specific question designed to bring you closer to the best solution.

If you're in advertising, sales promotion, speech writing, or any other field in which you need to dream up new ideas or phraseologies quickly, *IdeaFisher* will serve you better. Using this program for just one hour can yield hundreds of relevant concepts. If, on the other hand, you need a new solution to fundamental business problems, such as how to increase profits, streamline management, or design a new product, choose *Idea Generator Plus*. Its questions force you to focus on often-ignored particulars of your problem, and can thereby lead you to unexpected breakthroughs.

IDEAFISHER

IdeaFisher is to ideas what a thesaurus is to words. Once you supply it with an idea, it offers you many alternatives. It comprises two programs. One, called QBank, asks you questions about your problem. The questions are broken down into categories, such as marketing strategy, product name, and story line, that relate to the type of problem you're trying to solve. The questions are also categorized according to the stage of the problem-solving process that you're in, such as orientation, clarification, or evaluation.

After you answer these questions in QBank, you can associate keywords in your answers to the more than 60,000 words and phrases in *IdeaFisher*'s other constituent program, IdeaBank. To help you focus your work, these words and phrases are broken into 28 major categories, such as actions and motions; communication, entertainment, and the arts; and 390 subsidiary categories. The words and phrases are cross-referenced to form more than 700,000 associations. You can also add your own words and phrases and group them into your own categories.

IdeaBank is a fast brainstorming machine. I spoke to one user, the president of a food company, who used it to help him name a new product. He had already completed a five-hour brainstorming session with a dozen people when he turned to *IdeaFisher*. The five-hour session yielded 200 possible names, none of which satisfied the president. A one-hour session with *IdeaFisher* and one other person produced an additional 200 possibilities, including the eventual product name.

A copywriter at Starr Seigle McCombs, Hawaii's largest advertising agency, used *IdeaFisher* to create a slogan for a campaign to recruit new employees for Kentucky Fried Chicken. She developed the slogan "Come Home to Roost at K.F.C." after associating the words *chicken* and *nest* with other words in IdeaBank. A user who works for The Tom Peters Group uses *IdeaFisher* to help her come up with visuals for presentations. For example, to illustrate a training program for quality control, *IdeaFisher* led her to include such symbols as a clipboard, a

Bryan Mattimore is a creativity consultant with Mattimore Communications in Stamford, Conn.

ROGER T DEMUTH

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PC WEEK, *September 4, 1989*

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InfoWorld, *September 4, 1989*

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PUBLISHING			
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Built-in draw package	✓		
Individual cell font control	✓	✓	
Shading and borders	✓	✓	
Print graphs & spreadsheets side-by-side	✓	✓	
CONSOLIDATION			
Multiple spreadsheet windows	✓		✓
Multipage consolidation	✓		✓
Keyboard and mouse support	✓		
Lotus 1-2-3 v 2.01 compatibility	✓	✓	✓
Spreadsheet 640K RAM	11	8	NA
Capacity (NSTL) ** 1Mb RAM	18	12	5
Price***	$495	$495	$495

*Clip art from PicturePaks™ by Marketing Graphics Inc. (MGI) **NSTL (National Software Testing Labs) measured spreadsheet capacity by counting how many years of data could be added to a spreadsheet. Large numbers mean greater capacity. Performance for v 2.2 is with Allways attached.
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CIRCLE 112 ON READER SERVICE CARD

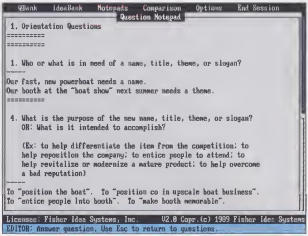
scale, a caliper, and a man in a white lab coat.

Although QBank and IdeaBank are designed to be used together, most of the users I spoke to spent very little time with QBank. That's because, with more than 200 questions in each category, it takes a lot of time to use the program. Moreover, many of the questions are similar enough to seem redundant. That frustrates creative personalities such as copywriters or promoters, whose working style is better suited to IdeaBank's method of free association.

But people in jobs other than the ones commonly referred to as creative report success with QBank. A marketing group specializing in supermarket distribution of nonfood items used QBank to help generate new ideas for promoting these items in the store. Among other questions, QBank asked the group, "Have you considered a different time of day?" The group realized that after rush hour, supermarket traffic is light and customers are less harried. That means some space opens up for a vendor to display a product, and customers have more time to listen to a sales pitch. From here the group went on to devise a campaign to encourage leading real estate, travel, and financial-service firms to bankroll temporary, manned information booths in supermarkets.

The greatest obstacle to using *IdeaFisher* may be its size. The program requires 14 megabytes of available hard-disk space to house its thousands of questions and answers. Even so, a freelance writer I spoke to thought the program important enough to dedicate a second computer to it. He uses *IdeaFisher* to quickly generate catchy titles and leads for his stories. According to the program's vendor, version 3.0 of the program, due to be released by the time you read this, reduces the memory requirement to 7 megabytes.

WITH IDEA GENERATOR PLUS, YOU CAN 'CALL A MEETING WITHOUT ANYONE BEING THERE.'



```
    QBank     IdeaBank     Notepads     Comparison     Options     End Session
                                 Question Notepad
 1. Orientation Questions
==========
==========

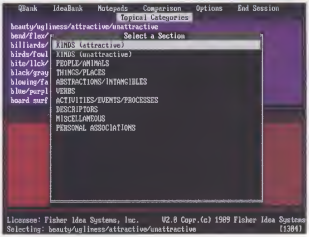
 1. Who or what is in need of a name, title, theme, or slogan?
-----
Our fast, new powerboat needs a name.
Our booth at the ~boat show~ next summer needs a theme.
==========

 4. What is the purpose of the new name, title, theme, or slogan?
    OR: What is it intended to accomplish?

    (Ex: to help differentiate the item from the competition; to
    help reposition the company; to entice people to attend; to
    help revitalize or modernize a mature product; to help overcome
    a bad reputation)
-----
To ~position the boat~.  To ~position co in upscale boat business~.
To ~entice people into booth~.  To ~make booth memorable~.

Licensee: Fisher Idea Systems, Inc.      V2.0 Copr.(c) 1989 Fisher Idea Systems
EDITOR: Answer question. Use Esc to return to questions.
```

FIGURE 1. ***IdeaFisher*'s QBank poses a series of questions and lets you record your responses. Later you can use these answers to identify ideas in the IdeaBank that will help solve your problem.**



```
    QBank     IdeaBank     Notepads     Comparison     Options     End Session
                                Topical Categories
  beauty/ugliness/attractive/unattractive
  bend/flex/                    Select a Section
  billiards/  KINDS (attractive)
  birds/fowl  KINDS (unattractive)
  bite/lick/  PEOPLE/ANIMALS
  black/gray  THINGS/PLACES
  blowing/fa  ABSTRACTIONS/INTANGIBLES
  blue/purpl  VERBS
  board surf  ACTIVITIES/EVENTS/PROCESSES
              DESCRIPTORS
              MISCELLANEOUS
              PERSONAL ASSOCIATIONS

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Selecting: beauty/ugliness/attractive/unattractive                      [1304]
```

FIGURE 2. ***IdeaFisher*'s IdeaBank organizes ideas into a hierarchy. In the background is a list of some of the program's topical categories. In the window in the foreground, the list's topmost category is broken down into more detail.**

If you define *IdeaFisher* as a brainstorming partner, then you can define *Idea Generator Plus* as a brainstorming instructor.

IDEA GENERATOR PLUS

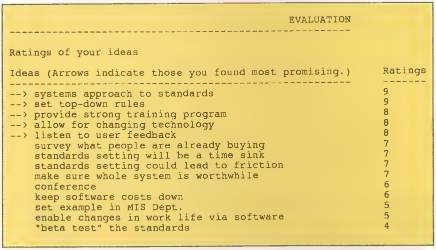
Idea Generator Plus begins by asking you to state your problem, to list the goals you hope to reach by solving the problem, and to list the other people or organizations associated with this problem. Then it leads you through seven rounds of questioning, each of which approaches the problem from a different perspective. For example, the program asks you to consider situations that are similar to your problem, to view the problem as if you were one of the other parties involved, or to consider ideas associated with your goals.

These perspectives are based on proven brainstorming techniques. By looking at your problem in these different ways, you are forced to explore factors that you might otherwise forget or consider unimportant.

Each round of questioning begins with general requests. The program then uses the responses to formulate more-specific questions. Even though the program uses no artificial intelligence—it just places each answer into the next question according to its predefined format—the program seems like a real interrogator, demanding specifics. In this way, *Idea Generator Plus* makes you focus more precisely on your problem than does *IdeaFisher*. Although it may not yield the same number of ideas that *IdeaFisher* does, it often yields just the solution you need.

For example, a real estate firm presented *Idea Generator Plus* with the problem of how to make a certain amount of profit in two years' time. The firm listed "hiring new brokers" and "making more high-priced sales" as two goals which, if reached, would solve their problem.

When *Idea Generator Plus* asked the firm how it could generate more high-priced sales, the firm responded that it should "contact more top executives." When the program asked the firm how it could meet more executives, the firm



```
                                     EVALUATION
----------------------------------------------------------

Ratings of your ideas

Ideas (Arrows indicate those you found most promising.)    Ratings
----------------------------------------------------------  -------
--> systems approach to standards                            9
--> set top-down rules                                       9
--> provide strong training program                          8
--> allow for changing technology                            8
--> listen to user feedback                                  8
    survey what people are already buying                    7
    standards setting will be a time sink                    7
    standards setting could lead to friction                 7
    make sure whole system is worthwhile                     7
    conference                                               6
    keep software costs down                                 6
    set example in MIS Dept.                                 5
    enable changes in work life via software                 5
    "beta test" the standards                                4
```

FIGURE 3. *Idea Generator Plus* prints summaries of your work. Portions of one such report appear above. The report addresses how to get users in a company to follow software standards.

suggested that it could meet them through business associations and country clubs. Other questioning suggested that the firm hire well-connected college graduates as new brokers.

The firm put these ideas together to create a recruitment plan. It sent a letter to business associations and social clubs asking members to encourage their graduating children to consider a career with the firm. In this way, it hoped to find both ideal brokers and ideal customers.

Considering other people's perspectives can help solve a variety of business problems. After *Idea Generator Plus* made him assume his customer's point of view, a man with a cash flow problem realized that if he offered a client a free gift, the client might be willing to pay him in 15 days rather than the standard 30 days. The plan worked.

Idea Generator Plus can also help you anticipate responses to new ideas. Randy Fields, chairman of Mrs. Fields Cookies, uses the program to "call a meeting without anyone being there." He enters the names of the people with whom he'd like to meet. He then records the responses he imagines each person would give to the questions posed by the program. Having seen a problem from each of those perspectives, he feels he has considered the problem thoroughly. Fields says that "gives me the courage of my convictions."

Finally, you can have *Idea Generator Plus* format the results of your work as a file that *Lotus Agenda* can read. Then from within *Idea Generator Plus*, you can load *Agenda*, which will automatically load the new file. *Idea Generator Plus* also predefines 11 *Agenda* "views" for the file. These views are different organizations of the data, each of which makes it easier for you to answer a particular question about your ideas. Using these views, you can explore your ideas further, assign due dates, review project schedules, delegate tasks, and review those assignments.

IdeaFisher and *Idea Generator Plus* are great whenever you feel that you've exhausted all options and want a fresh way of looking at a problem. You may, however, resent the structure that these programs impose on your thinking. You may also find working with a computer much less fun than brainstorming with a partner. Nonetheless, once you start using these programs, my advice is to stick with them. You might discover, as I did, that they can make you a more creative problem-solver. ■

IN BRIEF

IdeaFisher Version 2.0. Fisher Idea Systems, 18881 Von Karman, Ground Floor, Irvine, CA 92715; 800-289-4332, in Calif. 714-474-8111. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.1 or higher, 640K of RAM, and a hard disk with 14 megabytes of available space. Released 3/89. $495. 30-day money-back guarantee.

Idea Generator Plus Version 2.10. Experience In Software, 2039 Shattuck Ave., Suite 401, Berkeley, CA 94704, 800-678-7008, in Calif. 415-644-0694. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher and 256K of RAM. Released 11/88. $195; for owners of *Lotus Agenda*, $129. 90-day defective-disk warranty.

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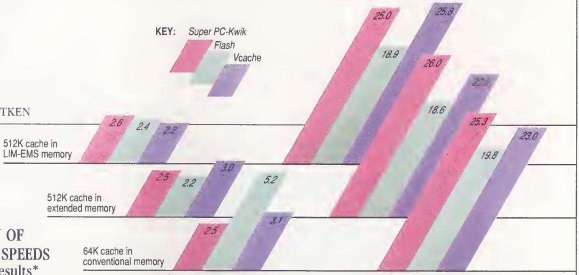
CIRCLE 113 ON READER SERVICE CARD

FASTER SAVES, FASTER SORTS

Vcache, *Super PC-Kwik Disk Accelerator*, and *Flash* improve disk speed.

BY PETER G. AITKEN



COMPARISON OF DISK CACHE SPEEDS
Selected Test Results*

*All times in seconds. Test performed on a 80386-based computer running at 20MHz

If you frequently save your *1-2-3* worksheets, or if you use a disk-based database program such as *dBase* or *Paradox*, your hard disk's speed is critical. Short of buying a faster hard disk, the best way to improve disk speed is to use a disk-cache (pronounced *cash*) program.

A disk-cache program creates a space, or cache, in RAM, where it stores copies of data that your application has read most frequently from your hard disk. If your application needs the same data again, it can retrieve that data from the cache rather than from the disk. Since accessing data in RAM is much faster than accessing data on disk, a disk cache can make your applications run faster and save you a lot of time over the course of a working day.

The benefit you derive from using a cache program depends on the nature of your work. If you frequently import data from your disk into your worksheets, do a lot of database work with a disk-based database application, or create lengthy documents with a word processor, you'll benefit more than someone who primarily does RAM-based spreadsheet work. Another variable is the amount of memory you can devote to a cache. The more memory available for the cache to use, the greater the chance that the cache will contain the data when you need it, and the greater the potential time savings.

Vcache, *Super PC-Kwik Disk Accelerator*, and *Flash* are excellent disk-cache programs that showed approximately equal results in my tests. Each can use either conventional, expanded, or extended memory to create its cache. *Super PC-Kwik* and *Flash* automatically detect the type and amount of memory you have and install themselves accordingly. *Vcache* comes with separate programs for each type of memory.

Each of these cache programs has several optional settings you can use to make the program work its fastest on your particular computer system. Some of these optional settings require more memory in exchange for the additional speed they deliver. In my tests, I used those settings which, according to each program's publisher, deliver the fastest performance. My conclusions are based on these settings. In some cases, you could set each product to occupy less memory, but not without detracting from its performance.

If you have only conventional memory, consider *Vcache* ($59.95). Compared to *Flash* and *Super PC-Kwik*, *Vcache* costs less, works the fastest when creating a cache in conventional memory, and requires the least amount of memory for a given cache size.

Super PC-Kwik ($79.95) is a good choice if your system has expanded memory because it works the fastest of the three programs when creating a cache in expanded memory. Also, if you are using it on this kind of system, *Super PC-Kwik* requires the least conventional memory of the three programs.

Flash ($69.95) distinguishes itself on 80286- and 80386-based systems that have lots of extended memory or that have a mixture of expanded and extended memory. It posts its fastest times when creating a cache in extended memory, and it can create a cache as large as 32 megabytes by combining all the types of memory you have.

Once you choose a disk-cache program, observe one important caveat: If you use a disk-optimizing program, a backup program, or another type of program that can manage all the information on your hard disk, be sure to back up your hard disk before installing the disk-cache program. Conflicts between disk-cache programs and disk-management programs are uncommon, but they can be disastrous when they occur.

VCACHE

The designers of *Vcache* have taken the adage "less is more" to heart. This program includes fewer special options than

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DAVE HANNUM

its competitors. However, when all three disk-cache programs were installed according to their default options, *Vcache* delivered comparable gains in speed.

When all three products were used to set up a cache in conventional memory, *Vcache* delivered the greatest overall time savings, speeding up disk-based operations by an average of 32%. *Vcache* requires 74K of RAM to set up a 64K cache in conventional memory. To set up a cache of the same size using *Flash* requires 99K, and with *Super PC-Kwik*, 94K.

FLASH INCLUDES A RAM DISK AND KEYBOARD ACCELERATOR.

Vcache's few limitations apply to relatively special cases. For example, unlike *Super PC-Kwik* and *Flash*, *Vcache* cannot include data from your hard-disk and floppy-disk drives in the same cache. If you want to create an additional cache for data stored on a floppy disk, you have to install another program that comes with *Vcache*. That program requires an additional 17K to 30K of conventional memory, depending on the capacity of your floppy-disk drive. Of course, if you can't spare that much memory, you can simply copy data from the floppy disk to your hard disk and forego the cache on the floppy-disk drive.

If your system includes both a hard-disk drive and a Bernoulli Box, *Vcache* will create a cache for only one of these drives at a time. However, the manufacturer claims that this problem has been corrected in version 4.1, which was released after this review.

SUPER PC-KWIK

Super PC-Kwik outdid the other two programs when creating a cache in expanded memory, speeding up operations by an average of 32%. The program lets you create a cache of up to 16 megabytes in expanded or extended memory.

Super PC-Kwik occupies only 16K of conventional memory when creating a cache in expanded memory. You can reduce that requirement to just 9K if you're willing to sacrifice a little speed. Economical use of conventional memory is important because some applications, such as *1-2-3* Releases 2, 2.01, and 2.2, must store corresponding information in conventional memory for each piece of data they store in expanded memory.

The cache you create with *Super PC-Kwik* can perform some operations in the background, freeing up your computer—and your time—for other work. For example, if you decide to copy several files from a floppy disk to your hard disk, *Super PC-Kwik* will return you to the DOS prompt before your computer has finished copying the files.

For $129.95 you can purchase the *PC-Kwik Power Pak*, which includes *Super PC-Kwik*, a print spooler, a RAM disk, and a keyboard accelerator. The print spooler lets you instruct your application to print a file and then immediately return to your application—or to another application—while the printer prints.

A RAM-disk program saves you time by using memory to emulate your disk drive. However, a RAM disk complements, and does not replace, a disk cache. A RAM disk speeds up access to the files that you copy into it, whereas a disk cache speeds up access to the files you use most. That means you have to know which files you need before you use a RAM disk. Also, a RAM disk does not automatically save changes back to your disk the way a disk cache does. For this reason, a RAM disk is best for speeding up lengthy operations during which your application reads data from the disk but does not write to it. For example, a RAM disk is excellent for printing a large, one-time report from a large database file.

FLASH

Flash outperformed the other two programs in tests that used extended memory, boosting disk-based operations by an average of 32%. *Flash* lets you combine whatever kind of memory you have—extended memory, expanded memory, or both—to create a single cache as large as 32 megabytes, which is as large as many people's hard disks. That virtually guarantees that any information you use once will be in the cache the next time you need it and that any disk-based operation will run faster.

If your system, like most people's, has significantly less than 32 megabytes of memory, *Flash* can still give you more control over the data it stores in its cache. Unlike the other programs tested, *Flash* lets you designate "high-priority" files—files that it will try to store in its disk cache at all times, memory permitting. If you have some files that you use quite often, this feature can save you lots of time. For example, if you have to sort a particular database regularly, you can save time by specifying certain index files as high-priority files.

Flash sets itself apart from the crowd in other ways, too. It includes a RAM-disk program and a keyboard accelerator at no extra cost. If you save or export files frequently, *Flash* provides a way to save even more time. When you instruct your application to write data to your disk, *Flash* can, at your option, return you immediately to your application and not write the data to disk until your keyboard has been idle for a few seconds.

But if you have only expanded memory and use large applications such as *dBase IV*, *Flash* could pose a problem. When installed to create a cache in expanded memory, *Flash* requires 35K of RAM, the largest amount of the three programs tested. Also, *Flash* posted the worst average time by far when creating a cache in conventional memory.

The program's weakest point, however, is its manual. It has the information you need to use the program, but because it's badly organized and poorly written, it takes a lot of time to find that information. And it takes expertise to use it once you find it. That's too bad—in all other respects, it's a fine program. ■

IN BRIEF

Vcache Version 4.0. Golden Bow Systems, 2665 Ariane Dr., Suite 207, San Diego, CA 92117; 800-284-3269. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers Requires DOS 2.0 or higher. Released 8/88. $59.95. 30-day defective-disk warranty.

Super PC-Kwik Disk Accelerator Version 3.22. Multisoft Corp., 15100 Southwest Koll Pkwy., Suite L, Beaverton, OR 97006; 800-288-5945. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher. Released 7/89. $79.95; $129.95 if purchased as part of *PC-Kwik Power Pak*, which includes a RAM disk, print spooler, and keyboard accelerator. 30-day money-back guarantee, 90-day warranty on defective disks or manuals

Flash Version 7.0. Software Masters, 6352 North Guilford Ave., Indianapolis, IN 46220; 800-253-5274, in Ind. 317-253-8008. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher. Released 10/89. $69.95. 30-day defective-disk warranty.

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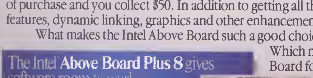

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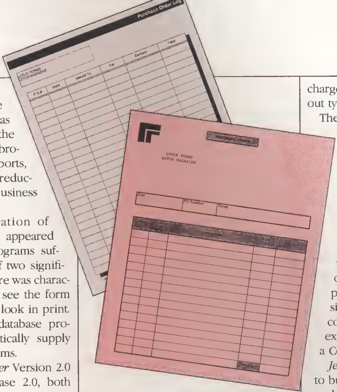
CIRCLE 114 ON READER SERVICE CARD

CUTTING THE COST OF BUSINESS FORMS

PerForm Designer & Filler Version 2.0 and *JetForm Design* Release 2.0

BY JON PEPPER



Sample forms prepared by using *JetForm Design* Release 2.0 (foreground) and *PerForm Designer & Filler* Version 2.0. Each program can automatically fill out the form by drawing on data stored in a compatible database file.

Spending a bundle on printed forms? Maybe you don't have to. Just as desktop publishing cut the cost of producing fliers, brochures, and spreadsheet reports, a new kind of software is reducing the cost of producing business forms.

When the first generation of forms-processing software appeared several years ago, the programs suffered from one or both of two significant limitations. The software was character-based, so you couldn't see the form on the screen as it would look in print. And it lacked tie-ins to database programs that could automatically supply data to help fill out the forms.

PerForm Designer & Filler Version 2.0 and *JetForm Design* Release 2.0, both second-generation versions, eliminate those problems. These programs let even novices generate well-designed forms without undue fuss, feature what-you-see-is-what-you-get user interfaces, and let you tap a variety of sources of data to automatically fill in forms.

Still, you may not need the "new and improved" versions we're reviewing here. If you need to print only a small number of invoices or time sheets, consider some other options. *Allways* (Funk Software, 800-822-3865; in Mass. 617-497-6339) or *Impress* (PC Publishing, 800-634-4555) running with *1-2-3* Release 2/2.01 or 2.2 or with *Symphony* will do the job. Or you can use any of the better word processors, such as *WordPerfect* 5.0, *Microsoft Word* 5.0, or *Lotus Manuscript* 2.1. All of these programs let you write text, draw lines and boxes, shade them, and produce high-quality output on laser printers.

But if you use a substantial number of forms and can't find what you want in a forms catalog, either *PerForm* or *JetForm* makes sense. Each program saves the expense of design and typesetting, and each lets you print forms on your laser printer. And when the forms need revising, you can do it on your PC.

WHICH TO CHOOSE

In some respects, *PerForm* and *JetForm* are close contenders. Both programs offer about the same design tools, use graphical user interfaces that work best with a mouse, and at print time can merge data into a form from a database file. That last feature is crucial if, for example, you want to use data already on file to fill in the names, addresses, and charges on a large batch of invoices without typing each of them.

The difference between the two products lies first with cost. *PerForm* ($294.95) costs significantly less than *JetForm* ($495). *PerForm* can be used with as simple a setup as an IBM PC XT or other 8088-based computer and a dot-matrix printer. When the time comes to use one of these programs to fill out some of the forms you've designed, such as purchase orders, hardware may become important. The task will probably be assigned to a clerical employee whose computer is more likely to be an inexpensive IBM PC XT than a PC AT or a Compaq Deskpro 386.

JetForm is not only more expensive to buy, it's more expensive to run. You need an IBM PC AT or other 80286-based computer, or a Compaq Deskpro 386 or other 80386-based computer, plus a PostScript or HP LaserJet–compatible laser printer. A run-time version of *Microsoft Windows* is included, although *JetForm*'s manufacturer recommends that you have a regular copy of *Windows* ($99 for the '286 version; $195 for the '386 version). The run-time version contains fewer screen and printer drivers and takes more memory.

The strongest advantage that *JetForm* delivers for the extra cost is that it is better suited for larger companies that use one of the minicomputers or workstations whose files the program can read directly.

Microsoft Windows lends *JetForm* an easy-to-use graphical user interface not dissimilar to the interface used in Apple's Macintosh computer. *PerForm*, too, offers an easy-to-use graphical user interface, but it uses Digital Research's *GEM/3*, a run-time version of which is included with the program.

Jon Pepper wrote about forms-processing software for Ideas & Trends in the June issue.

Windows offers two advantages over *GEM/3*. You can run more than one application simultaneously, and you can transfer data among those applications. That suggests the potential to do such things as design a logo in your *Windows*-based drawing program and copy it into your form. However, you may not want to run *JetForm* with other programs because doing so dramatically slows that program. That is true even on an 80386-based computer.

TWO PRODUCTS IN ONE

Both *PerForm* and *JetForm* include two subsidiary programs: a design module and a merge module. Using *PerForm*'s design module is a lot like working with a *GEM*-based graphics program. A selection of drawing tools appears in an on-screen tool box. You can draw circles, shaded boxes, lines of almost any thickness, and bar codes. A particularly useful tool automatically produces the evenly spaced horizontal or vertical dividers that appear on many forms. To round out the design offerings, *PerForm* will read graphics, logos, and images stored in a variety of file formats, including TIFF, *GEM* Image, *GEM* Line Art, *MacPaint*'s MSP, *PC Paintbrush*'s PCX file format, and compatibles.

Feature Chart: PerForm vs. JetForm

	PerForm Design & Filler	JetForm Design
Edit graphics	No	Yes[1]
Bar codes	Yes	Yes
Vary form size	Yes	Yes
Vary line thickness	Yes	Yes
Vary gray scale	Yes	Yes
Grids/rulers	Yes	Yes
Mix typefaces	Yes	Yes
Mix point sizes	Yes	Yes
Fonts	Bitstream & Postscript-compatible printer fonts	Bitstream, Type Director and printer fonts
Accept scanned forms	Yes	Yes
Calculate fields	Yes	Yes
Validate fields	Yes	Yes
Graphic import/export	*GEM* Line Art; import only: TIFF, *GEM* Image, PCX, MSP	TIFF, MSP, PCX, PIC
File import/export	ASCII, *dBase III Plus*	ASCII, *dBase III* & *IV*, UNIX (w/*JFMerge*)
Import WK1 files directly	No	No
On-line help	Yes	Yes
Tutorial	Yes	Yes
Templates	Yes (29)	Yes (8)
Undo	Yes	Yes
Interface	*GEM/3*	*Windows*
Supports mouse	Yes	Yes
Printer	Any *GEM*-compatible printer	Laser printers only
Price	$294.95	$495

[1] Will edit only graphics designed by *JetForm*

PerForm comes with only two fonts: Dutch and Swiss. However, you can use a wide range of additional fonts. If you have a PostScript printer, you can use that printer's built-in fonts, as well as any fonts that run under the *GEM/3* operating environment, including Bitstream's Fontware Library, which includes hundreds of type styles.

JetForm offers a similar range of drawing tools, including one that creates bar codes. The program also adds the ability to draw arcs, and it gives you more precise control than *PerForm* does over the program's drawing pencil by tracking the pencil's location with on-screen X and Y coordinates. The program also provides a more extensive selection of fonts, which comes from *Microsoft Windows* and includes Times, Courier, Helvetica, and line-printer fonts. *JetForm* can also use Bitstream fonts.

We found *PerForm* to be somewhat easier to learn than *JetForm*. In *PerForm* the *GEM/3* interface puts fewer items on the screen than does the *Windows* interface without reducing the number of things you can do. However, when questions arose, *JetForm* had a better help facility to deal with them. With either product, plan on about a half day to get acquainted before you settle down to work.

In our evaluation of these products, we designed two forms—a simple telephone record and a more complex form that included shading, many different fonts, and bar codes. We found that the time it took to prepare the simple form was about the same with both programs. Once you learn the software, you can create a simple form in about an hour.

Designing a complex form is a different matter altogether. Not counting the time you spend charting a form with pencil and paper, you could easily spend an entire work day getting the form right. That's what happened to us. Our experience is not so much a comment on the products as a caveat that forms processors won't automatically create complex forms any more readily than desktop-publishing programs will automatically create brochures.

FILLING IN THE BLANKS

With some forms, such as telephone logs and material requisitions, all you need to do is design and print them. They are made to be filled out by hand. But with other forms, it's not uncommon that some or all of the information you need to complete the form is in a database. For example, the data you need to fill out invoices, such as the names and addresses of your customers and the amounts they owe, may all be available through your accounting program. If you have a significant number of invoices to complete, you don't want to type all that information onto a form when it's already stored in a computer that can do the work for you.

PerForm allows you to fill in a form either on the screen before you print it or by importing the data from a database file. The program can read *dBase III, III Plus*, or *IV* files, and ASCII comma-delimited files. The ASCII file format is one that many of the more popular database programs, including *dBase IV, Paradox*, and *R:Base*, can produce. However, *PerForm*, like *JetForm*, cannot directly read worksheet files. *1-2-3* and *Symphony* users will first have to save the file as an ASCII file.

JetForm, too, allows you to fill in a form on the screen, and it will read files in ASCII, *dBase III, III Plus,* and *IV* formats. The program is unique among forms processors in that it is able to read data in formats that are used on such minicomputers as the HP 3000, HP 9000, Digital Equipment

Corp. VAX computers, and a number of UNIX-based systems. *JetForm* also lets you specify calculated fields, so you can total an invoice, for example. And it lets you validate data as it is being entered, so it can reject data that falls outside certain bounds.

In our tests, when it came time to print, *PerForm* was about 20% faster than *JetForm*. The latter program, although slower, is faster than most *Windows*-based programs. *JetForm* substitutes its own printer drivers for those supplied with *Windows*, a feature that not only speeds up the process of printing your form, but for a given graphic, requires a fraction of the memory that would be required by the *Windows* drivers. A new version of *JetForm* is scheduled to be released around the time of this article's publication. That version will add support for more printers and let you use impact printers to fill out preprinted forms.

This by no means defines the limits of your options when it comes to state-of-the-art forms-processing software. In our next review of forms processors, we will compare *PerForm* and *JetForm* with a product that was unavailable at the time of this review, *Xerox FormBase*. *FormBase* adds a new twist to this genre of software by marrying a database-management program to a forms-processing program. ■

IN BRIEF

PerForm Designer & Filler Version 2.0. Delrina Technology, 15495 Los Gatos Blvd., Suite 8, Los Gatos, CA 95032; 408-356-9981. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires 640K of RAM, a hard disk, DOS 2.1 or higher, and a graphics card (CGA or higher). A mouse is recommended. Supports most laser and dot-matrix printers. Includes run-time version of *GEM/3* system software. Released 6/89. $294.95. Limited 60-day money-back guarantee.

JetForm Design Release 2.0. Indigo Software Ltd., 560 Rochester St., Suite #400, Ottawa, Ontario K1S 5K2; 800-267-9976, in Canada 613-594-3026. Runs on the IBM PC AT, PS/2, and compatible computers with a hard disk and 640K of RAM. Requires DOS 3.0 or higher. *Microsoft Windows* is optional. A mouse is required, as is a PostScript- or HP LaserJet–compatible laser printer. Any graphics card-and-monitor combination that is supported by *Microsoft Windows* is acceptable. Released 5/89. $495.

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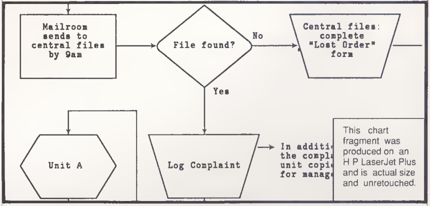
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ADVERTISER INDEX

Reader Service Number	Advertiser	Page
—	AT&T	18–19
113	Baler Software	95
111	Banner Blue	89
109	BASF	61
112	Borland International	93
104	Canon U.S.A. Inc.	6–7
—	Compaq Computer Corporation	33–36
107	DynaCorp	37
115	HavenTree Software Limited	101
—	IBM Corporation	46–47
114	Intel	98
—	Lotus Development Corporation	26–27, 53–55, 83
105	MECA Ventures	23
—	Microsoft Corporation.	62, 107
108	Osborne/McGraw-Hill	45
101	Pacific Data Products	Cover 2
110	Park Technologies	80
106	Personics Corporation.	13
117	Quarterdeck Office Systems	Cover 4
—	Software Publishing Corporation.	105
102	Sony Corporation	3
103	Toshiba America Inc	5
116	Unison World	Cover 3

QUICK ADS

Reader Service Number	Advertiser	Page
120	Application Engineering	109
121	Austin Scientific	109
122	Best Power Technology	109
123	Business Forecast Systems	109
124	DAR Software Products	109
125	Lerman Associates	109
126	MetraByte Corporation	109
127	PLAN Systems International	109
128	Spreadsheet Solutions	109

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NO.	TITLE	PAGE
1	STAFF LETTER	2
2	IDEAS & TRENDS	8
3	@LOTUS	20
4	START HERE More on Database Management	24
5	1-2-3 MACROS Set Up Your Databases Automatically	28
6	FOR DEVELOPERS When to Avoid the {BRANCH} Command	32
7	FEATURE To Control Production: Point and Shoot	38
8	FEATURE Range Names Are Easier to Remember	48
9	FEATURE The Normal Curve—A Simpler Way	56
10	SPECIAL REPORT Choose the Right Database Program	64
11	SPECIAL REPORT 3 Ways to Analyze Databases	67
12	SPECIAL REPORT Query External Tables with *1-2-3* Release 3	70
13	SPECIAL REPORT A Fast Way to Build Data-Entry Forms	73
14	SPECIAL REPORT Custom Reports from *Symphony*	77
15	SPECIAL REPORT Database Add-Ins for *1-2-3*	81
16	Q&A	84
17	GOOD IDEAS	88
18	REVIEW *IdeaFisher, Idea Generator Plus*	92
19	REVIEW *Vcache, Super PC-Kwik Disk Accelerator,* and *Flash*	96
20	REVIEW *PerForm Designer & Filler 2.0* and *JetForm Design 2 0*	99
21	NEW PRODUCTS	103
22	ESSAY Changing User-Mis Relationship	110

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December 1989

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Name

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Comments

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147
148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

EDITORIAL EVALUATION

Article No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 Excellent	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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3 Fair	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189
190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210

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Article No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
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4 Poor ☐
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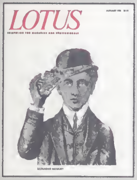

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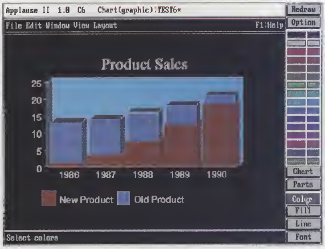
Applause II: Chart and Draw in 16.7 Million Colors

Ashton-Tate Corp.'s new presentation-graphics program, *Applause II*, combines in one program the ability to chart, draw, and create on-screen presentations. It includes the standard types of charts—pie, bar, line, XY, and high-low-close—as well as word charts and organization charts. The program reads files directly from *1-2-3*; however, it can't do the same for *Symphony* files.

A word-wrap facility makes it easier for you to create word charts. And organization charts are simple to specify: Just write an outline of the reporting relationships. Redo the outline, and the program will redraw the chart. A comprehensive set of drawing tools lets you tailor the chart's appearance.

Applause II lets you chart a greater number of data points than you can by using *Lotus Freelance Plus*, *Harvard Graphics*, or *Lotus Graphwriter II*. In *Applause II*, you can chart up to 10 series of 600 points; in *Freelance Plus* or *Graphwriter*, up to 4 series of 500 points or 8 series of 225 points; in *Harvard Graphics*, up to 8 series of 240 points. The program will also do linear, exponential, and logarithmic regression analyses, and will project any of those analyses forward for any number of periods.



Select colors

***Applause II* lets you define charts, draw, and make on-screen presentations in separate windows. The charting window shown here displays a graph based on data imported from *1-2-3*.**

Drawing strength

Applause II's drawing function is significantly stronger than *Harvard Graphics*'. It also offers several unique capabilities that are unavailable in *Freelance Plus*. For example, *Applause II* lets you shade backgrounds and produce a series of images that shows the progression of an object changing from one shape to another.

However, the program's "select" function, which you use to indicate what you want to work on, is harder to use than the same facility in *Freelance Plus*. Once you select one object in *Freelance Plus*, you can have the program select any similar objects for you. For example, if you wanted to change the font of all text within a series of boxes on an organizational chart you are creating, you could select some text and then let the program select the rest for you. In *Applause II*, in most cases you will have to select each item individually.

The program comes with a library of 400 clip-art images you can use in your graphics. *Applause II* also includes eight Bitstream fonts and is compatible with any aftermarket Bitstream fonts you may purchase. On a letter-by-letter basis, you can specify the type style, size, and color, as well as the attributes to create an underline, superscript or subscript character, and more.

In addition to reading *1-2-3* worksheet files, the program reads ASCII files, *dBase* files, and files stored using programs in Ashton-Tate's Master Graphics series, among others. *Applause II* can import named graphs stored in a *1-2-3* worksheet, but it cannot import PIC files. It can import color or black-and-white images from files created by a host of scanners and paint programs.

1-2-3 connection

As with *Freelance Plus* and *Graphwriter II*, *Applause II* lets you view a *1-2-3* worksheet file before you specify what data you'd like to graph. After you update your worksheet file, you must reimport it with *Applause II*, but you need not respecify the data you want to chart. *Applause II* will automatically update the chart with the new data. It cannot automatically update multiple charts that you'll print on a single page.

While you create a graph, *Applause II* displays the graph image. It also offers a good screen representation of the colors and fonts you've specified. If you use an EGA or VGA card, the program mixes patterns of colors to approximate up to 5,000 colors on the screen at one time. You can choose from among a total of 16.7 million colors, all of which can be represented within a single slide. No other program approaches *Applause II*

ALSO IN THIS SECTION

BUSINESS, FINANCE 104
UTILITIES 104
OTHER SOFTWARE 106
UPGRADES........................ 106
BOOKS........................... 108

in this category. *Harvard Graphics*, which on most output devices offers more colors than *Freelance Plus*, lets you use only 16 colors on any screen or slide at one time. —*William Saunders*

Applause II. Ashton-Tate, 20101 Hamilton Ave., Torrance, Calif., 90502-1319; 800-437-4329 ext. 1301. Runs on the IBM PC XT, PC AT, or PS/2 Model 30 or higher computer, as well as 100%-compatible computers. Requires 512K of RAM and one of the following display adapters: CGA, EGA, VGA, Hercules Graphics Card, Vermont Microsystems' Image Manager 640 or VM-8820, IBM's 8514A, or DGIS-compatible display adapter. Released 11/89. $495; upgrade from *Draw Applause* or any program in the Master Graphics series, $79. 90-day defective-disk warranty.

CIRCLE 1 ON READER SERVICE CARD

BUSINESS, FINANCE

Over 60 Ready-to-Use Spreadsheets on a Disk

Worksheets-On-A-Disk contains more than 60 common business applications that are designed to accommodate even novice *1-2-3* users. For instance, some of the templates allow you to age accounts receivable, calculate annual bonuses, create and print invoices, value an inventory, personalize letters, summarize sales by products, and calculate monthly loan payments. The manual that comes with the program explains how you can adapt the worksheets to your own situation.

Requires *1-2-3* Release 2.0 or higher and comes on a 5¼- or 3½-inch disk. $59.95, from InfoSource, 420 Lake Howell Rd., Maitland, FL 32751; 800-622-2995.

CIRCLE 2 ON READER SERVICE CARD

Simple Statistical Add-in for Nonstatisticians

ForeCalc is a *1-2-3* and *Symphony* add-in that lets you forecast from one series of data stored in a range in your worksheet. From among three widely used exponential-smoothing models, the program selects the best model for your data. A more knowledgeable forecaster can customize the model. The program will automatically generate a macro that displays a graph of your data and creates a named graph for you.

Requires *1-2-3* Release 2/2.01 or higher or any release of *Symphony*. $149, from Business Forecast Systems, 68 Leonard St., Belmont, MA 02178; 617-484-5050.

CIRCLE 3 ON READER SERVICE CARD

TIM LEWIS

1-2-3 Template Allows CPAs to Sample Audits

PPS Audit Sampling lets auditors sample accounting data by using the probability-proportional-to-size (PPS) method. The method is typically used when you expect few errors in the data you are sampling. The software selects a sample from data in a worksheet or in any fixed-length or delimited ASCII file. It lets you prepare reports that document your entire audit, including all input variables. The template's methods follow *Audit Sampling*, a guide published by the American Institute of Certified Public Accountants. A demonstration included on-disk walks you through a complete sample audit.

Requires *1-2-3* Release 2.01 and 640K of RAM for the template and *1-2-3*. $125, from Interactive Templates Corp., 1152 North Mountain Ave., Suite 110, Upland, CA 91786; 714-949-4010.

CIRCLE 4 ON READER SERVICE CARD

Professional's Bond Calculator on Three Computer Platforms

Bond Portfolio Calculations lets you analyze bonds and treasury securities on PCs, workstations, and mainframe computers. The program is available in two modules. One comes with proprietary calculations to figure yields for stepped, stripped, and payment-in-kind bonds. The other module comes with calculations to figure yields for securities with periodic payments, those sold at a discount, and those bearing interest at maturity. Included in both modules are accrued and flat price-from-yield, accrued and flat yield-from-price, Macauley and modified bond-duration, bond-convexity, accrued-interest, and date-operation calculations. Most calculations adhere to Securities Industry Association and Public Securities Association standards. However, certain calculations also let you follow Wall Street conventions, such as showing bond prices with or without accrued interest. The program provides a variety of American and international day-count bases.

Runs on the IBM PC, PS/2, and compatible computers; Sun Microsystems, DEC, HP, and Apollo workstations; DEC minicomputers; and IBM, Stratus, and other mainframe computers. $1,600 each for the PC versions; $15,000 each for the midsize VAX versions; $19,200 each for the mainframe versions. From Intex Solutions, 161 Highland Ave., Needham, MA 02194; 617-449-6222.

CIRCLE 5 ON READER SERVICE CARD

UTILITIES

1-2-3 Add-in Highlights Related Worksheet Areas

Color Your Spreadsheet lets you add colors to any area of your worksheet display. You can also assign different colors to each range format, to different types of cell entries, to unprotected cells, and to negative numbers. You may choose from eight colors, so you have 128 color combinations. The program automatically saves your color choices whenever you save the worksheet.

Requires *1-2-3* Release 2/2.01 or 2.2 and a CGA, EGA, or VGA graphics adapter. Uses 38K of RAM. $39.95, from Toast Development Corp., 1221 4th Ave., New Westminster, B.C., Canada V3M 1T8; 604-879-4074.

CIRCLE 6 ON READER SERVICE CARD

SPSS Linked to dBase

dBase Stats is a version of the popular *SPSS/PC+* statistics program, which you can call from within *dBase III Plus* or *dBase IV* or run as a stand-alone package. *dBase Stats* directly reads and writes files from *1-2-3* Releases 1A and 2, *Symphony* Releases 1.0 and 2.0, *Microsoft Multiplan*, as well as *dBase* files that contain up to 256 fields and any number of records. *dBase Stats* provides statistical operations, such as analysis of variance, correlation, cross tabulation, curve fitting, and *t* tests for paired and independent samples. Graph types include box plot, histogram, and bar chart. The software includes on-line help.

Runs on the IBM PC XT, PS/2 Model 50 and higher, and compatible computers with 512K of RAM, a hard disk, and DOS 2.1 or higher. Supports a math coprocessor. $399.95, from Ashton-Tate Corp.,

Add These Extras For Nothing Extra.

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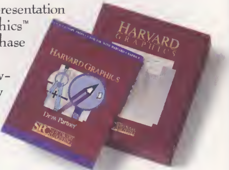

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Current Harvard Graphics users: see your dealer to purchase Draw Partner separately at a special introductory price.
Runs on IBM PC and MS DOS compatibles. ©1989 Software Publishing Corporation, 1901 Landings Drive, Mountain View, CA 94039-7210

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In Canada call 1-416-566-0566.

20101 Hamilton Ave., Torrance, CA 90502-1319; 800-234-8283.
CIRCLE 7 ON READER SERVICE CARD

Distribute Mainframe-Generated Worksheet Data to PCs

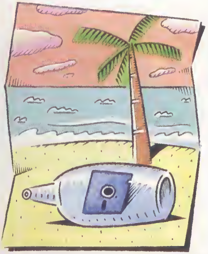
While working within any mainframe application, *WIC* (Worksheet InterChange) lets you save your data as WKS, WK1, WR1, or WK3 files on the mainframe. WIC lets you create worksheets containing *1-2-3* formulas and formatted ranges within the application running on the mainframe. You must, however, use a communications program, electronic mail, or a means other than *WIC* to transfer the files to your PC.

Runs on IBM mainframes and Prime and DEC minicomputers. $11,000 to $20,000, depending on the size of the mainframe or mini. From Research & Planning, 222 Third St., Suite 2323, Cambridge, MA 02142; 617-547-5061.
CIRCLE 8 ON READER SERVICE CARD

OTHER SOFTWARE

OS/2 Capabilities Extended to Groups of DOS-Based PCs

Polymod2 is a multitasking operating system that enables you to concurrently run up to twelve 8088-based, 80286-based, or 80386-based PCs connected to a PC that is running *1-2-3* or another OS/2 standard application. The peripheral PCs can run any OS/2 application that resides in the central PC—even if the peripheral PCs have no more memory than needed to run DOS. A user at any PC can leave a DOS-based application running in the background and toggle into an OS/2 application that runs in text mode, such as *Microsoft Word, WordPerfect, Oracle*, or *Higgins E-Mail*.



TIM LEWIS

If you connect the OS/2 host to a token-ring network, local area network manager, mainframe, or minicomputer, all the peripheral *Polymod2* computers will have equal access to the larger systems as well. There is no limit to the number of users that can hook into the configuration through modems, and you can use the central computer for other applications while it's directing the show.

Runs with all versions of DOS and OS/2 and provides a PC-terminal emulator to run on a locally or remotely connected PC. $1,600 per OS/2 host for end-user version; $2,800 per OS/2 host for developer's kit that includes the end-user version, from Software Lifeline, 2600 Military Trail, Suite 290, Boca Raton, FL 33431; 800-462-5667.
CIRCLE 9 ON READER SERVICE CARD

Worksheet-Mouse Connection

MarqPlus provides pop-up, pull-down menus for *1-2-3* that tile, or abut, one another. The screen displays a representation of your function keys, so you can execute function-key commands by using a mouse. You can move the cell pointer to any area of your worksheet by using a mouse in a small diagram that remains in a corner of the screen while you work on a worksheet. You can, among other things, scroll diagonally through your worksheet, define a range, and set a column width. The program lets you direct the Return key to move the cell pointer to the next cell while you enter or edit data. The manufacturer claims that using *MarqPlus* doesn't degrade performance of *1-2-3*. You can disable the mouse at any time, and it automatically disables when you invoke the *1-2-3* Add-In Manager.

Requires *1-2-3* Release 2/2.01 or 2.2; a Release 1A version is also available directly from the manufacturer. Runs with any two- or three-button mouse. Uses 35K of RAM. $69.95, from Mouse Systems Corp., 47505 Seabridge Dr., Fremont, CA 94538; 415-656-1117.
CIRCLE 10 ON READER SERVICE CARD

Ready Database, Spreadsheet Data for WordPerfect

Perfect Complement and *Perfect Complement for Oracle* let you merge data from spreadsheets and databases into *WordPerfect* documents. Both packages let you extract data from *1-2-3* and *Symphony* worksheets. Using *Perfect Complement*, you can extract data from *dBase* III and higher, *Paradox* 2.0 and higher, *FoxBase*, or *Clipper*. The other package works with *Oracle*. Each package loads *WordPerfect* and lets you put extracted data into *WordPerfect*'s file format so that you can use *WordPerfect* to print a document. A library in *Perfect Complement* lets you store settings you've used to extract various types of data. Each package lets you create a name and address file with up to 22 fields, and each can run on a local area network.

Requires *WordPerfect* 4.0 or higher and an IBM PC, PS/2, or compatible computer with 640K of RAM and a hard disk. $149.95 for *Perfect Complement*; $295 for the *Oracle* version, from Perfect Complement Corp., 4979 Mercantile Rd., Baltimore, MD 21236; in the continental United States and Canada 800-444-9544, in Hawaii 301-256-2000.
CIRCLE 11 ON READER SERVICE CARD

UPGRADES

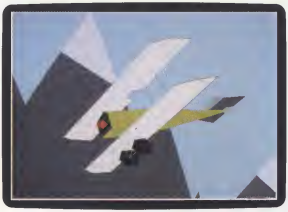
WordPerfect 5.1 adds versatile table formatting, an equation editor, layered menus to use with a mouse, and the capacity to print over 1,700 characters on any supported graphics printer. It automatically adds borders and grids to tables. You can easily combine any two contiguous boxes within the grid and resize any box. You can import ranges from *1-2-3* Releases 2/2.01 and 2.2, *Microsoft Excel*, or *PlanPerfect* 5.0 into the boxes or into any other part of the document. Each table can have up to 32 columns and 32,765 rows. Within each box, text will wrap automatically, but you can't use tabs.

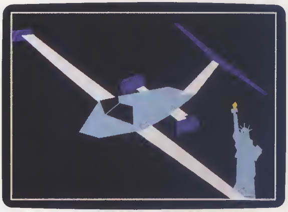
The equation editor provides a comprehensive set of mathematical symbols, characters, and functions. With an EGA or VGA card, you can preview an equation. A marker remains in your document in lieu of the equation. You can print any *WordPerfect* character or symbol if you have a graphics-capable printer, such as an HP LaserJet or Epson dot-matrix printer, because you can print any of its characters as a graphic. You can store a graphic in a separate file or link it to your document, and *WordPerfect* will automatically read the graphic when you preview or print.

You also get improvements to existing features: Its mail merge is more powerful and easier to understand; the dictionary contains hyphenation information; files can have up to 40 characters; help is context sensitive; tabs automatically position themselves relative to the margin rather than the edge of the paper; and margins can be set for ragged right, ragged left, ragged right and left, or justified right and left.

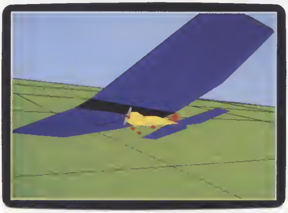
Runs on the IBM PC, PS/2, and compat-

Experience the history of aviation.

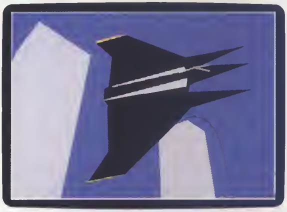




Or make aviation history.

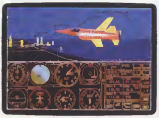


New Flight Simulator lets you put wings more commonly seen on a 747 on a Cessna and redefine the word "lift."

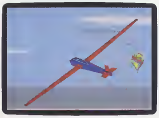


Brave souls can light up the Manhattan skyline with the most radical jet this side of the B2.

It's a known fact that Microsoft® Flight Simulator® provides the most realistic, exhilarating flying experience you'll find on a PC. Desktop pilots have taken to the skies in all kinds of different aircraft, from a WWI Ace to a modern-day jet.



The control panel lets you know exactly how much control you do, or don't, have.



And when you leave the ground, you don't even have to fly. You can glide, in our new sailplane.

Now we've added features to the new Flight Simulator 4.0 that'll throw you for a loop. Literally.

For starters, you can design your own plane. Which gives you the chance to investigate the acceleration characteristics of a 1000 horsepower Cessna. Or the lead-balloon characteristics of a wingless sailplane.

Equally adventurous is the weather. New Flight Simulator randomly creates clouds, wind, storms, you name it, when you least expect it.

We've also added an array of air and runway traffic, including a Boeing 767. You even get runway clearance from the control tower, to make every landing a happy one.

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ible computers with 640K of RAM and 720K floppy drives. Requires an EGA or VGA card to display all characters. Manufacturer recommends a hard disk. $495; $85 to upgrade from any version, from WordPerfect Corp., 1555 North Technology Way, Orem, UT 84057; 801-225-5000.
CIRCLE 12 ON READER SERVICE CARD

Autocast II/Batch 2 now reads from and writes to *1-2-3* and *Symphony* worksheets. The package runs forecasts in batches using any number of files in a given subdirectory. The program does not run in the background. The program will run faster with a math coprocessor.

Runs with *1-2-3* Release 1A, 2/2.01, or 2.2 or any version of *Symphony* on an IBM PC, PS/2, or compatible computer with 512K of RAM. Manufacturer recommends a math coprocessor. $2,900, from Levenbach Associates, 103 Washington St., Suite 348, Morristown, NJ 07960; 201-285-9248.
CIRCLE 13 ON READER SERVICE CARD

Quicken 3 adds cash, credit card, asset, and liability accounts to its previous version. The accounts are integrated so that you can enter transactions in more than one account at a time. The software shows you the balance on each of your credit cards, lets you reconcile your credit card statements, and automatically generates checks for outstanding bills. You can also pay bills electronically by using *Quicken 3* and a service from Checkfree Corp. (Columbus, Ohio, 614-898-6000).

Quicken 3 templates let you generate several reports, including balance sheet, profit-and-loss, accounts payable, accounts receivable, cash flow, job or project status, and payroll reports. You can flag entries that are tax related and produce a tax-summary report. The program imports and exports standard ASCII files. *Quicken Transfer Utility* ($19.95; $9.95 for upgrade) supports almost all Lotus worksheet formats. Release 3 users, however, must first translate their files to the WK1 file format.

Runs on the IBM PC, PS/2, and compatible computers and uses 320K of RAM. $59.95, from Intuit, 540 University Ave., Palo Alto, CA 94301; 800-624-8742.
CIRCLE 14 ON READER SERVICE CARD

Digi-duit! 2.0 provides several enhancements to its user interface. The software automatically names a font file for you. The name is descriptive of the face and style and is recognizable to most word-processing and desktop-publishing packages, including *Lotus Manuscript* and *Corel Draw!*, as well as to *Microsoft Windows* and GEM. The program now supports a mouse and provides a direct interface to *Digi-install!*, which installs fonts into *WordPerfect, Microsoft Word, Xerox Ventura Publisher*, GEM, and *Aldus PageMaker*. New special effects let you turn any soft font into an outline of itself, control the line thickness, add drop shadows of any depth in any direction, and choose up to 12 fill patterns. A new symbol set lets you determine what characters are included and what order the characters are in.

TIM LEWIS

Runs with the IBM PC and compatible computers with DOS 3.0 or higher and a hard disk and with the Hewlett-Packard HP LaserJet Series II, LaserJet Plus, and DeskJet printers. Uses 384K of RAM. $89.95 including eight scalable type styles; $129.95 for the DeskJet version; $489.90 including 272 scalable type styles. From Digi-Fonts, 528 Commons Dr., Golden, CO 80401; 800-242-5665.
CIRCLE 15 ON READER SERVICE CARD

BOOKS

The ABC's of 1-2-3 Release 2.2, by Chris Gilbert and Laurie Williams. Teaches the basics of Release 2.2 to new users. Published August 1989, 275 pages, $19.95 (paperback), from Sybex, 2021 Challenger Dr., Bldg. 100, Alameda, CA 94501; 415-523-8233.
CIRCLE 16 ON READER SERVICE CARD

The ABC's of 1-2-3 Release 3, by Judd Robbins. Designed for new *1-2-3* users. Published September 1989, 275 pages, $19.95 (paperback), from Sybex, 2021 Challenger Dr., Bldg. 100, Alameda, CA 94501; 415-523-8233.
CIRCLE 17 ON READER SERVICE CARD

The Complete Lotus 1-2-3 Release 2.2 Handbook, by Greg Harvey. Discusses every operation in Release 2.2. Published October 1989, 750 pages, $24.95 (paperback), from Sybex, 2021 Challenger Dr., Bldg. 100, Alameda, CA 94501; 415-523-8233.
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Mastering 1-2-3 Release 3, by Carolyn Jorgensen. Written primarily for those already familiar with Release 2. Published July 1989, 825 pages, $24.95 (paperback), from Sybex, 2021 Challenger Dr., Bldg. 100, Alameda, CA 94501; 415-523-8233.
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1-2-3 Release 3: The Complete Reference, by Mary Campbell. Covers every Release 3 feature, function, and command. Published June 1989, 1072 pages, $28.95 (paperback), from Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900.
CIRCLE 20 ON READER SERVICE CARD

1-2-3 Release 3 Made Easy, by Mary Campbell. Covers spreadsheet basics for first-time and experienced users. Published August 1989, 526 pages, $19.95 (paperback), from Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900.
CIRCLE 21 ON READER SERVICE CARD

1-2-3 Macro Library 3rd Edition, by Que Corp. Covers simple and complex macros to automate spreadsheet applications; comes with companion disk. Published December 1989, 600 pages, $39.95 (for paperback book and disk), from Que Corp., 11711 North College Ave., Carmel, IN 46032; 800-428-5331.
CIRCLE 22 ON READER SERVICE CARD

1-2-3 Release 3 Quick Reference, by Que Corp. Covers the basic commands and functions in Release 3. Published August 1989, 160 pages, $7.95 (paperback), from Que Corp., 11711 North College Ave., Carmel, IN 46032; 800-428-5331.
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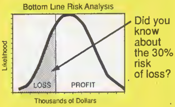

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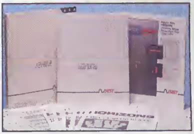

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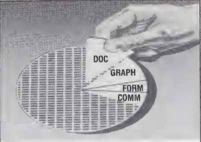

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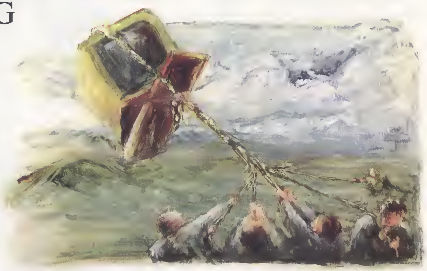

BY FRANK ROSE

Forget Woodstock. It was overrated at the time, and anyway another milestone is already upon us—one that's arguably of far more lasting significance. I am speaking, of course, of the tenth anniversary of *VisiCalc*.

Before *VisiCalc*, personal computers were toys—fun for hackers who liked to diddle with electronics but not suited to serious business. *VisiCalc,* released in the fall of 1979 by a fledgling Silicon Valley company called Personal Software, was the product that ushered the personal computer into the American office. In the process, it wrested power away from the data-processing managers who controlled corporate mainframes.

Like most revolutionary developments, *VisiCalc* didn't seem that impressive at first. Dan Bricklin, the Harvard student who had the idea for the product, was laughed at when he explained it to his finance professor. Dan Fylstra, the Harvard MBA who marketed it, had been selling video-game programs out of his Cambridge (Mass.) apartment just a few months before. When Fylstra took a prototype to Mike Markkula, Apple's chairman at that time, Markkula seemed much more interested in his own checkbook-balancing program, which he proceeded to demonstrate to Fylstra.

Yet once it was released, *VisiCalc* proved irresistible. As the first commercially available, fully interactive spreadsheet to run on any computer, personal or otherwise, it gave financial planners a brand new tool. Since any reasonably senior individual could get a $3,000 purchase order approved without too much trouble, personal computers (Apple IIs, since that's what *VisiCalc* ran on) popped up on desks all over corporate America. The data-processing managers, much to their chagrin, were not consulted on these purchases.

The price of the personal-computer revolution, predictably enough, was data anarchy. Lotus's *1-2-3,* introduced in 1983 for the IBM PC, did for that machine what *VisiCalc* had done for the Apple II. Unfortunately, none of these computers could interact very efficiently with each other or with the mainframes the DP people controlled. Meanwhile, corporate bean-counters were beginning to tote up all the money being wasted on individual purchases of PCs instead of the substantial discounts their company could have been getting by ordering PCs a thousand at a time. As for data security, it was nonexistent. Order had to be restored, and the DP department was clearly the agency to do it.

But by the mid-80s, personal computing had changed the landscape irrevocably. The old DP technocracy had become so centralized, so rigidly authoritarian, it was almost a parody of the corporate bureaucracy it served. Implicit in its worldview was the assumption that man should be subservient to machine. In the 1960s, even after the development of time-sharing made it possible to equip mainframes with remote terminals that would give every user a screen and keyboard, data-processing executives continued to promote the merits of batch processing. That cumbersome one-job-at-a-time system required people to come to the DP department to schedule their computing needs. Personal computers had replaced all that with a fragmented environment of small, friendly (more or less) machines clearly intended to do their masters' bidding. No one was proposing that this environment be dismantled, only that it be harnessed.

What drove that demand more than anything was the emerging technology of networking, which promised to link these desktop computers with corporate mainframes in a seamless web of data. Networking would reunite small and large computers, but on its own terms. The DP department, already reborn as "information systems," was about to see its top managers emerge guru-like on the corporate organization chart as "chief information officers." But the domain these potentates governed would have been unrecognizable to the batch-processing diehards of 20 years before.

And it wasn't just a decentralized computer system that these new MIS departments inherited. It was a whole new corporate paradigm—one dictated by personal computing and network technology. In the information age, everyone seems to agree, the quickened pace of decision-making demands an organizational structure that's fluid, dynamic, and open-ended, like the flow of electrons that constitutes information itself.

So while the DP people may once again be in charge, now it's the users who set the terms: a computer on every desk, decentralization of authority, and an end to rigid hierarchies. No one would deny that the demand for standardization and compatibility has curtailed some of the individual creativity that used to be associated with stand-alone desktop computers. But if, on this tenth anniversary of the program that moved those computers into the American office, you ask which side won, the answer has to be both. ■

Frank Rose's most recent book is West of Eden: The End of Innocence at Apple Computer, *published by Viking Penguin, 1989.*

RICHARD HOLLANT

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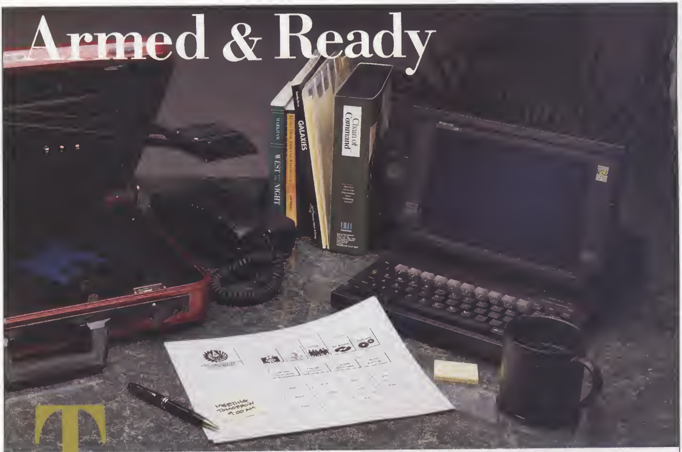

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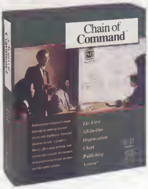

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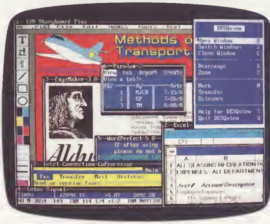

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